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: November 6, 2026 - November 12, 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

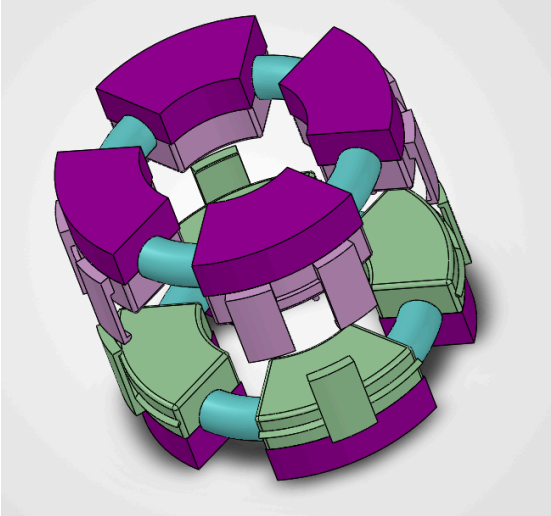
The team is continuing to develop prototypes of the design. Each iteration is bringing in different ideas. The team successfully printed prototypes that are 5 times the size needed for arteries. This design was printed in flexible 80A and does not have a functional clamping mechanism. The team is working 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.

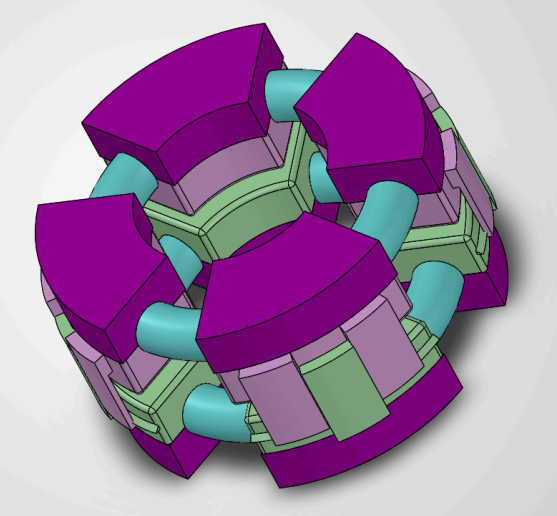
Difficulties/advice requests

The team is working on designing a testing apparatus and could use advice on available materials and how to put an apparatus together. The team is also working on creating an alternate device and could use advice on what materials to use and how to develop an initial prototype.

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 final design of the silicone ring design
2. Gather materials for testing apparatus
3. Fabricate initial prototype for alternate design

Next week's individual goals

- Simon Fetherston
    - Pour silicone to create final silicone ring design

    - Determine best way to fix the pins to the device
    - Assist in assembling testing apparatus
- Catie King
    - Order tubing material
    - Model tube/sleeve device in solidworks - add texture?
    - Begin fabrication/modeling of adjustable mechanism
    - Help with testing
- Megan Lee
    - Order tubing/sheet material
    - Begin prototyping adjustable mechanisms
    - Help with testing
- Lydia Miller
    - Order tubing material
    - Begin fabrication of adjustable mechanism
    - Assist with testing
- Drew Hay
    - Build testing apparatus
    - Fabricate final designs
    - Test designs

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
        - Iterated 3D model of the silicone ring final fabrication mold
        - 3D printed parts for final design
    - Catie King
        - Met with client
        - Met with team to discuss materials
        - Printed new rigid pieces with resin tough
    - Lydia Miller
        - Met with team to discuss design
        - Print new rigid pieces using tough resin
        - Met with client to discuss design
    - Megan Lee
        - Met with team to discuss designs
        - Printed new rigid pieces
        - Met with client
    - Drew Hay
        - Created testing protocol for leakage and burst pressure testing
        - Met with clients to discuss new design ideas, testing plans, and materials for testing
- Team:
    - Split up tasks to fabricate GEM coupler device, plan testing of this device, and pivot to new proposed design

Activities

Name	**Date**	**Activity**	**Time (h)**	**Week Total (h)**	**Sem. Total (h)**
Simon Fetherston	11/6-11/12	- Worked on 3D models of ring molds - 3D printed parts for final design	3 1	4	38
Catie King	11/6-11/12	- Met with team to plan new design (tube/sleeve, adjustable mechanism) - Researched tube materials - Researched sutures for adjustable mechanism for sleeve - Worked on decision matrix for tube	0.5 1 0.5 1	4	34.5

		materials - Made “ideas” page for adjustable mechanism to share with clients	1		
Megan Lee	11/6-11/12	- Brainstormed new design materials and mechanisms - Met with team to discuss new design ideas and testing mechanism - Created new design matrix for tube/sheet materials	1 2 1	4	35.5
Lydia Miller	11/6-11/12	- Made a plan for new design (tubing, mechanism, etc) - Research tubing materials - Research and draw tightening mechanism, idea - Made decision matrix for tubing material - Made “ideas” page for mechanisms to show clients	.5 .5 .5 1 1	3.5	35
Drew Hay		- Created testing protocol for leakage and burst pressure testing - Met with clients to discuss new design ideas, testing plans, and materials for testing	2.5 1	3.5	37.5