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 13, 2026 - November 19, 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.

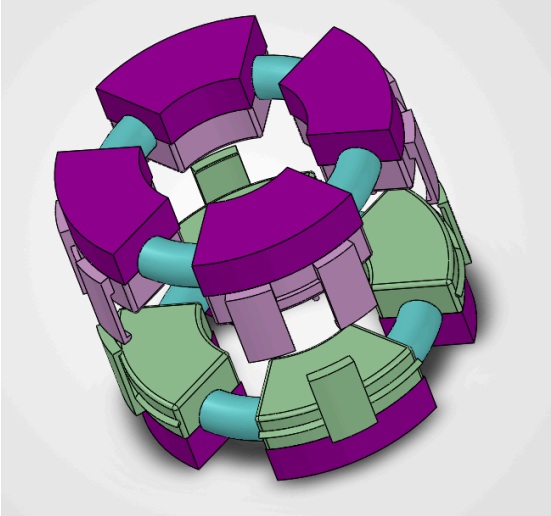
Brief status update

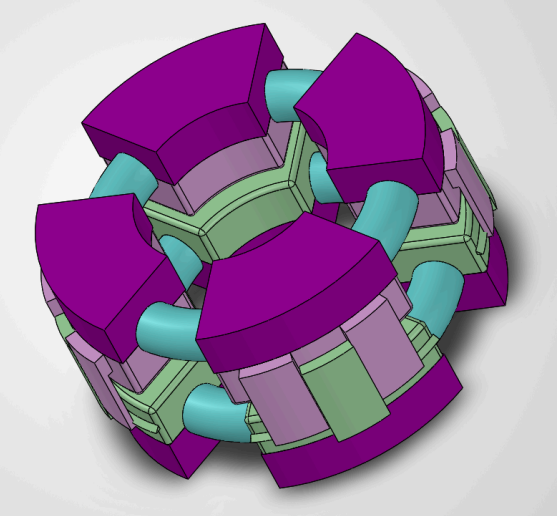
The team has fabricated the GEM coupler inspired device with the clients. The team will be working on fabricating more with the silicone pouring in the team lab for tensile and pressure testing. The new device idea has been 3D printed and must be revised to reduce friction and increase stiffness.

Difficulties/advice requests

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
    - Create final prototypes to use for testing

        - Begin testing
- Catie King
    - Begin flow and tensile testing for coupler design
    - Iterate new design
- Megan Lee
    - Begin testing on old design
    - Continue prototyping new design
- Lydia Miller
    - Continue new design prototype iteration
    - Test old design (tensile + pressure)
- Drew Hay
    - Fabricate final design
    - Begin testing

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
        - Created a functional final design
        - 3D printed and iterated designs
    - Catie King
        - Met with clients to fabricate old design

        - Processed 3D prints
    - Lydia Miller
        - Brainstormed new design idea
        - Iterated old designs
    - Megan Lee
        - 3D printed and processed old design
        - Started brainstorming new design ideas and adjustability mechanisms
    - Drew Hay
        - Created a functional final design (Silicone pouring)
        - Finalized order form for testing apparatus
- Team:
    -

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Simon Fetherston	11/13-11/19	- Reworked solidworks models for 3D printing material compatibility - 3D printed parts - Did post processing on 3D parts - Poured silicone to make a final part	2 1 2 1	6	44
Catie King		- Fabrication of old design (silicone pouring) - Post processing for 3D prints	1 2	3	37.5
Megan Lee		- Create and print lock cord - Post processing for 3D prints - Silicone ring pouring - 3D print rings and molds	1 2 1 1	5	40.5
Lydia Miller		- Silicone pouring for rings - Created solidworks model for C shaped tubes for new design - Printed new design	1 1.5 1	5	40

		- Post processing for 3D prints	1.5		
Drew Hay		- Created a functional final design (Silicone pouring) - Finalized order form for testing apparatus	1 1	2	39.5