

# Designing a 3D-Printed Rotating Disk for a Hemocompatibility Chamber



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# Background

## Stents

- Tubes prevent arteries from closing due to buildup over time
- Coronary Heart Disease: over 15 million cases in USA
- Materials: metal (titanium or stainless steel) and plastics
- How effective and safe are these materials and what other biocompatible materials could be used in manufacturing stents?
- Design a hemocompatibility chamber to test materials



Fig 1. Sketch of metal mesh stent

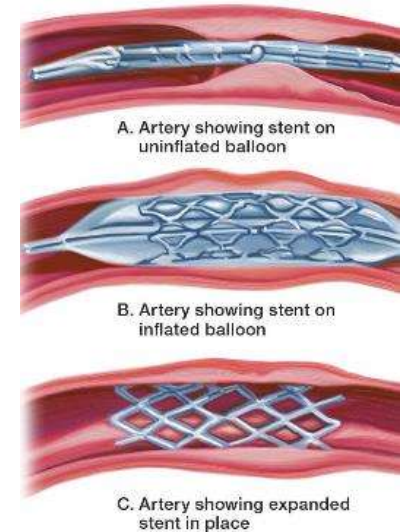


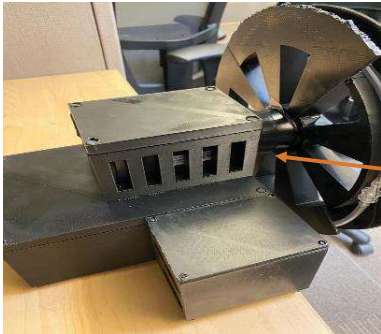
Fig 2. Diagram of insertion of stent



# Experimental Setup

Initial Design

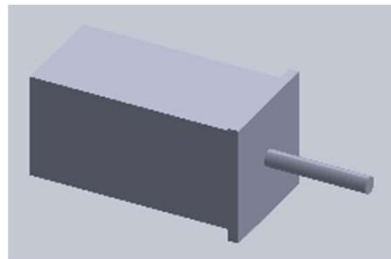
- Mechanical and Electrical components
- Design
- Coding
- Assembly



**Fig 3.** Picture of Hemocompatibility Chamber by Vignesh Manivasagam

Evaluation

- Design
- Assess material (ABS)
- Ideal conditions
- Efficiency: water resistance and assembly

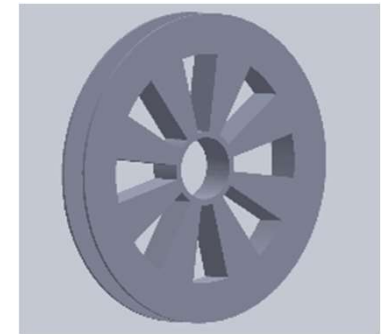


**Fig 4.** Motor Design on Solidworks by V. Manivasagam

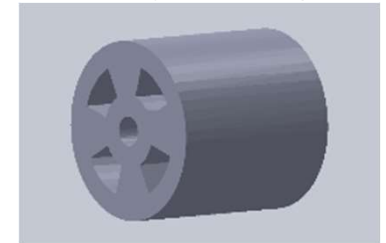


**Fig 5.** Motor shaft attachment with flat side

Redesign



**Fig 6.** Original disk design on Solidworks by V. Manivasagam



**Fig 7.** Original shaft attachment design on Solidworks by V. Manivasagam



## 1. Training



### Idea2Product Lab

Speeding Innovation, Creativity, & Product Development

Fig 8. Image of Lulzbot Taz  
6 3D-Printer

## 2. Design

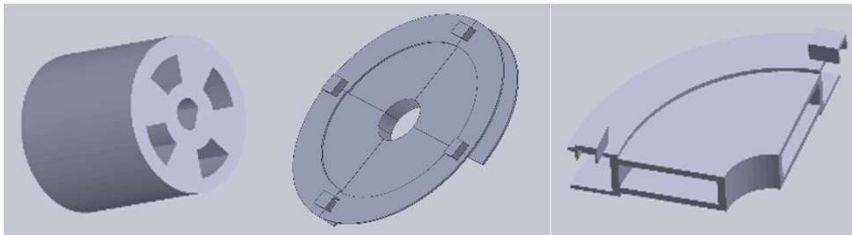


Fig 9. Design of new shaft  
attachment and disk

## 3. Print

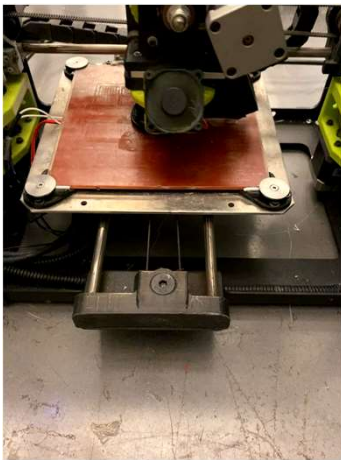


Fig 10. Video of  
shaft attachment  
being printed



Fig 11. Printed shaft  
attachment

# Methods

3D-Printing



## 4. Reprint



Fig 12. Delamination on  $\frac{1}{4}$  of the disk



Fig 13. Video of part 1 of disk being reprinted

## 5. Assembly



Fig 14. Back side of Disk



Fig 15. Top view of disk

Results



## Next Steps

- Testing the second prototype as well as running the simulation software of the disk again would give further insight into aspects of the design that could be further improved. For example, after this process it was notable that the point of weakness in the design was where the disk was glued to the shaft attachment. The risk of rupture could be decreased if it was 3D-printed in conjunction to the disk or snap hooks where added.
- Once it is determined that the design of the hemocompatibility chamber is ideal, the device can advance to test different material stents.

## Conclusions

- It is important to further explore 3D-printing settings and possibilities.
- Supports were critical in the design of the disk.
- Gain further knowledge in slicing on Solidworks and Cura

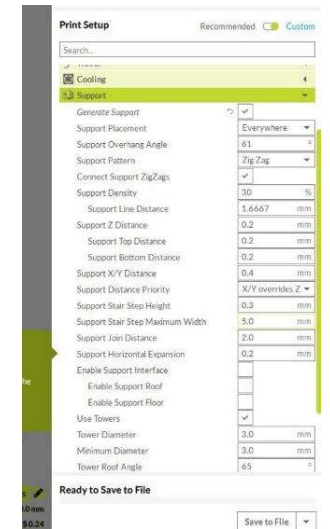


Fig 16. Screenshot of support slicing options on Cura software before printing



## What benefits did you get from you SURE experience?

- Thank you to the SURE program I was able to acquire new skill sets
  - 3D-Printing
  - Solidworks software program
  - lab Training
  - virtual communication
- Gain knowledge in an engineering area outside of chemical and biological
- Make connections and network with different people within the college of engineering
- Better understanding of what to expect in a work environment doing research
- Increased confidence in ability to transfer knowledge from class setting to the field

## References & Acknowledgements

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# Thank you



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