

# Fabricating Prosthetic Sockets with Rapid Prototyping Technology

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## Background

The conventional process used in prosthetic socket fabrication is a time intensive, manual technique that does not allow for precise control of the resulting socket's dimension parameters and depends on the craftsmanship of highly skilled prosthetists.

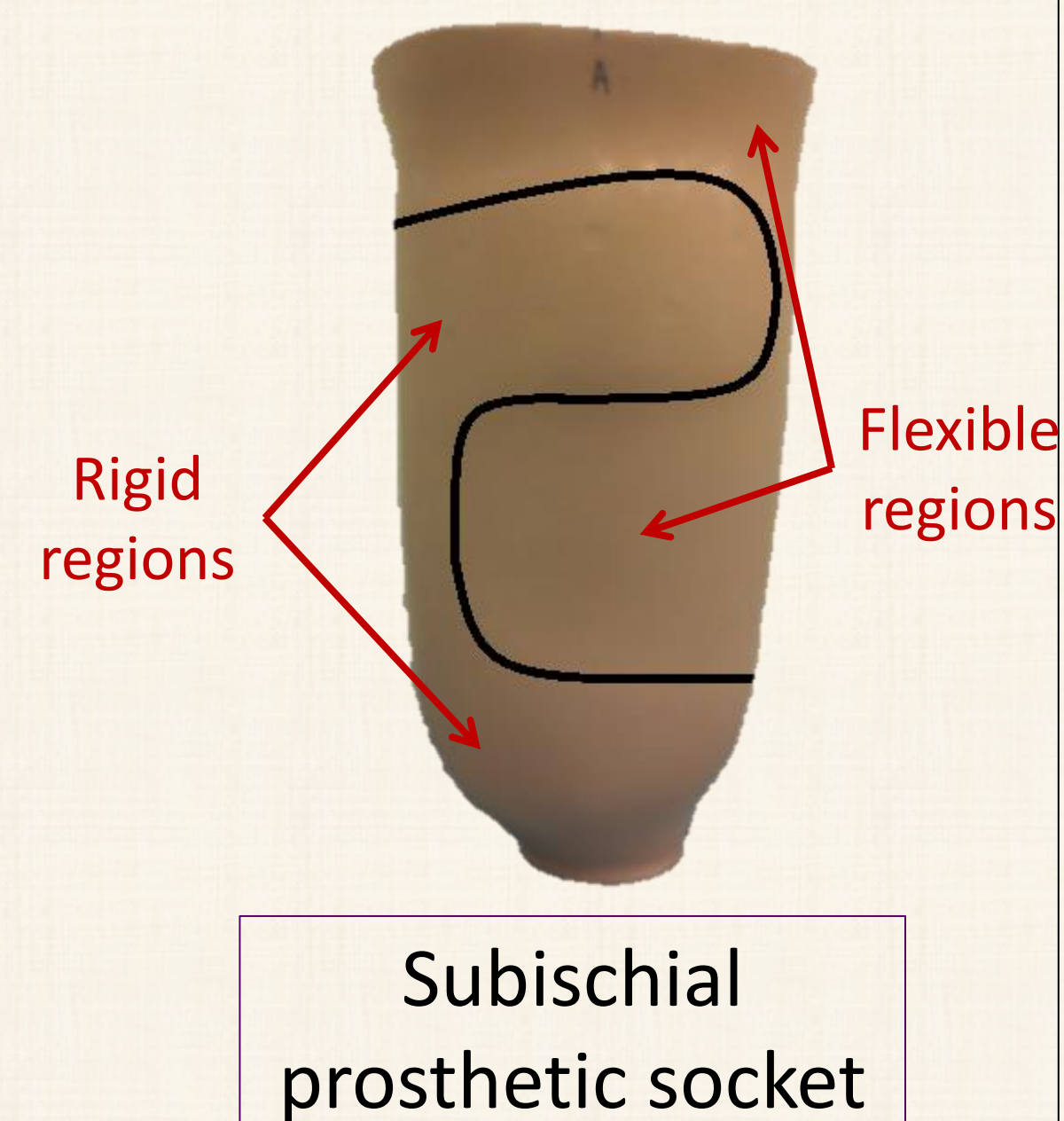
### Purpose of the Study

To develop a process for fabricating a subischial transfemoral prosthetic socket with a flexible sleeve and a rigid frame using rapid prototyping technology.

## Introduction

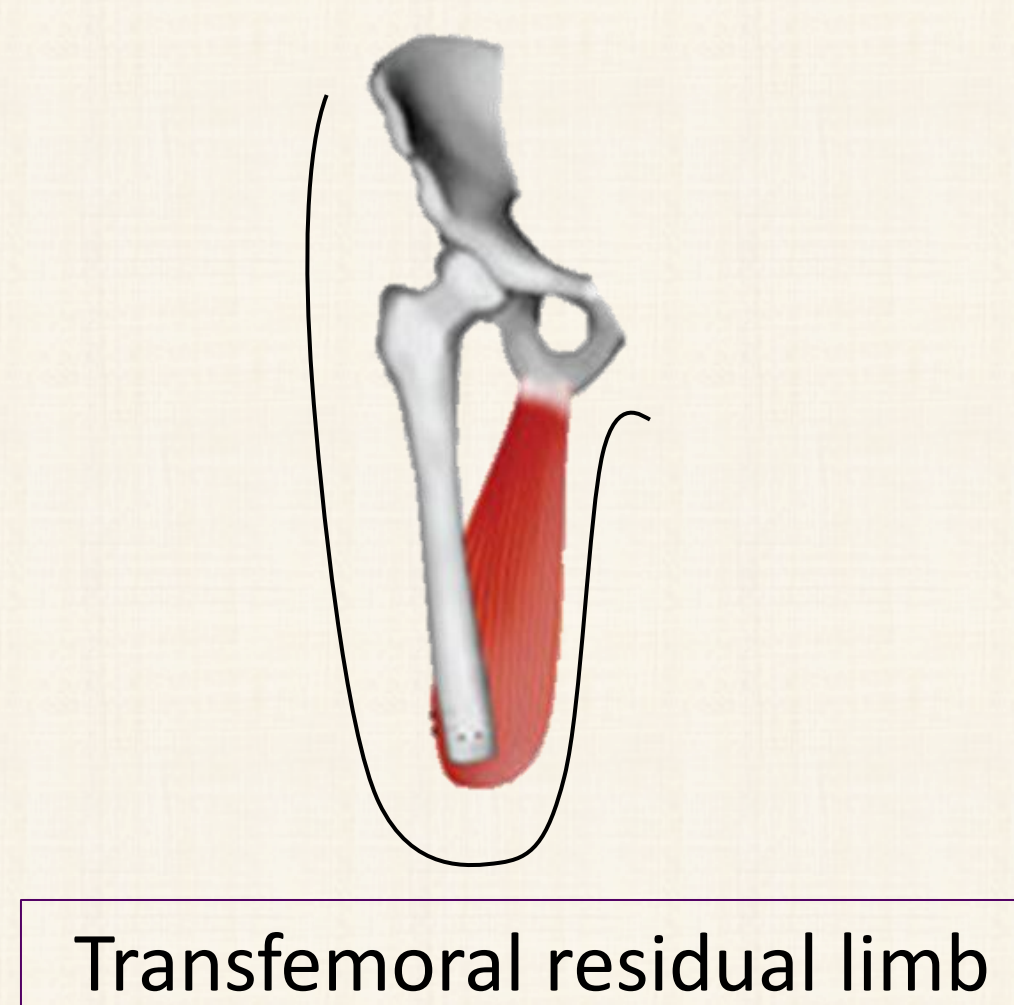
### Manual Fabrication of a Transfemoral Prosthetic Socket

- Drawbacks:
  - Time and resource intensive
  - Requires expert prosthetist
  - Little control of socket dimension parameters (e.g. thickness)
- Socket Design
  - Rigid frame sandwiched between two flexible layers

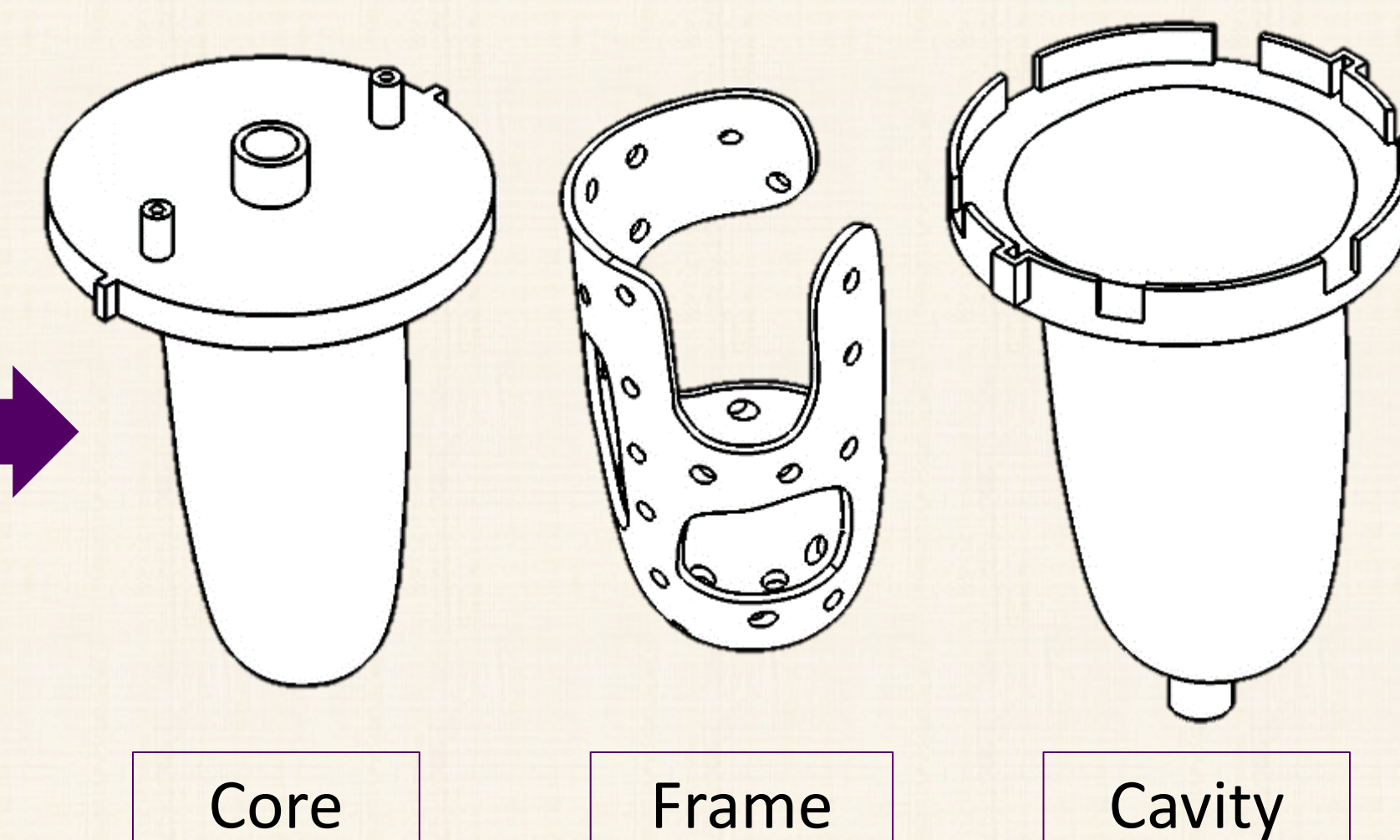


### Approach Overview

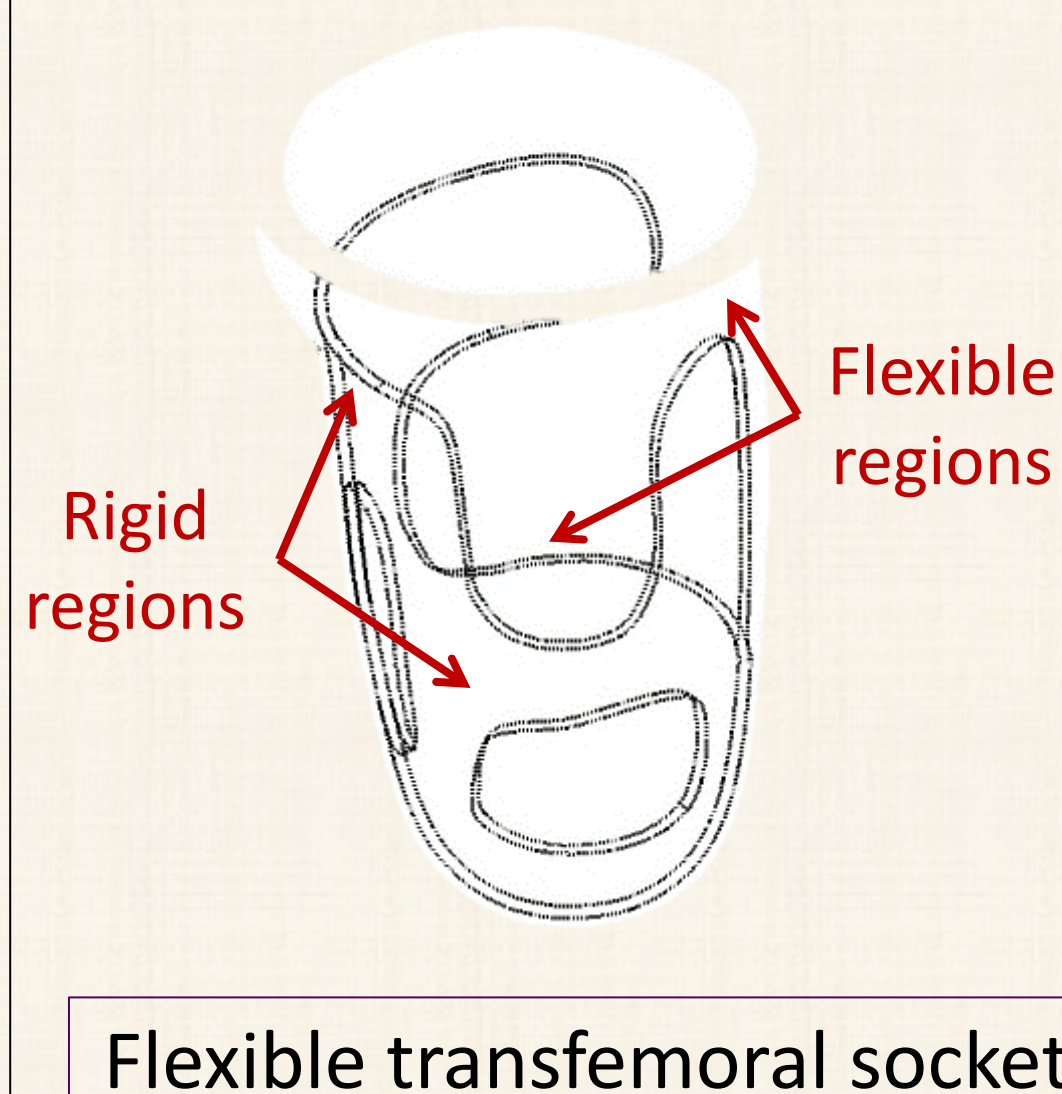
#### 1. Scan of residual limb



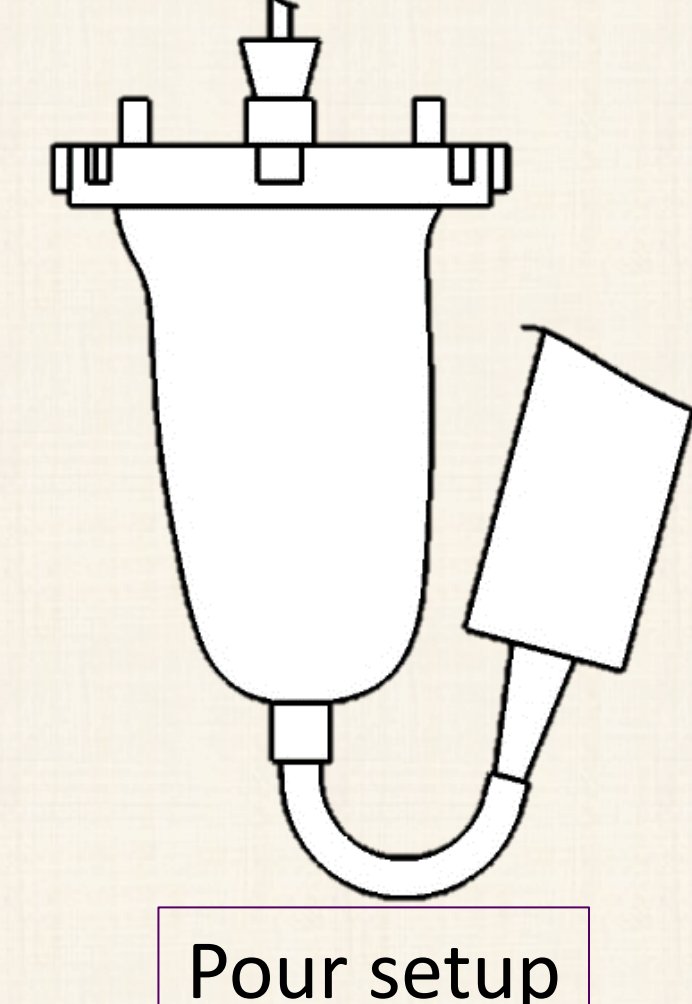
#### 2. Design with SolidWorks



#### 4. Fabricated Socket

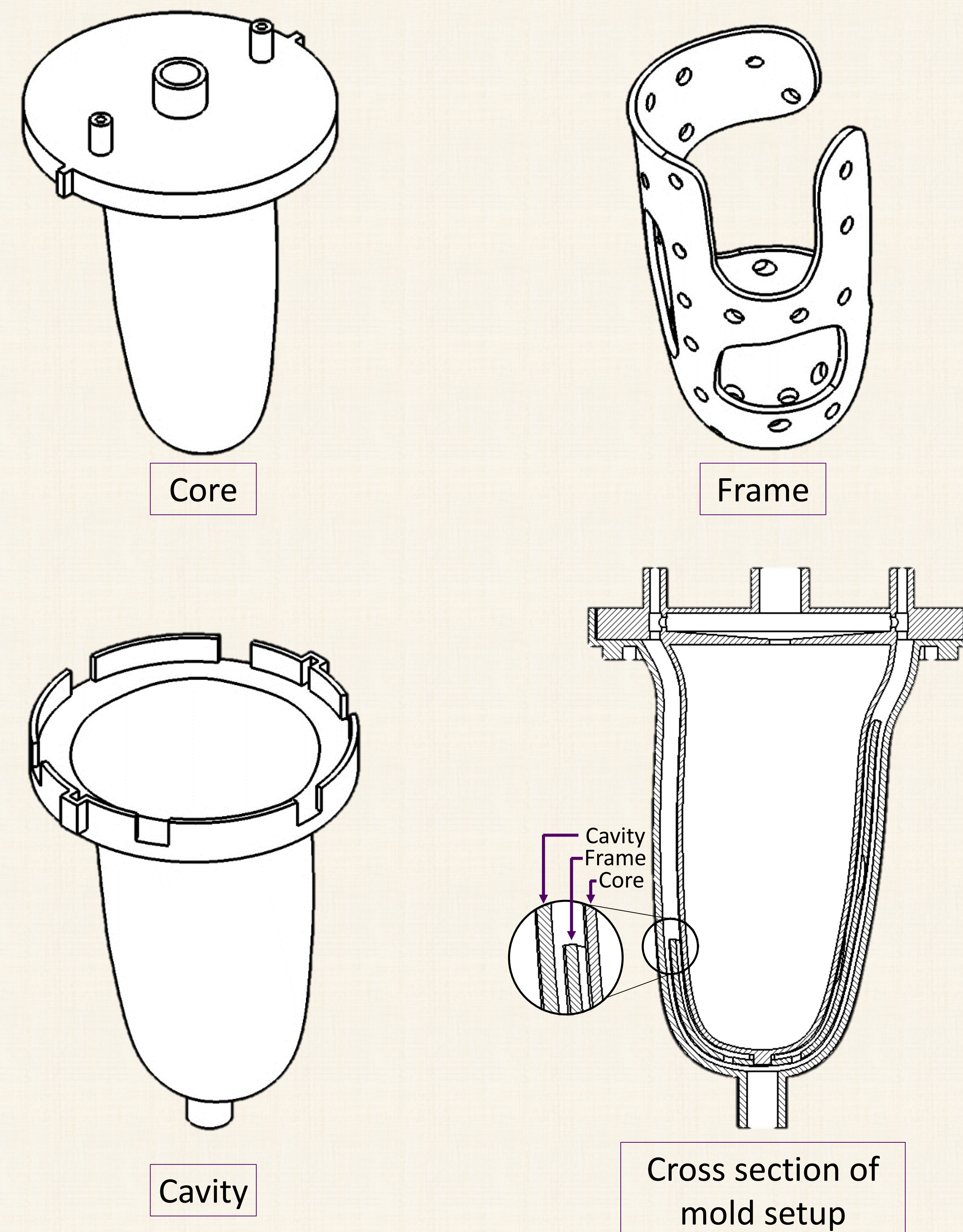


#### 3. Build components with Stratasys and pour flexible material



## Methods/Results

### Mold design with CAD software (SolidWorks 2011)



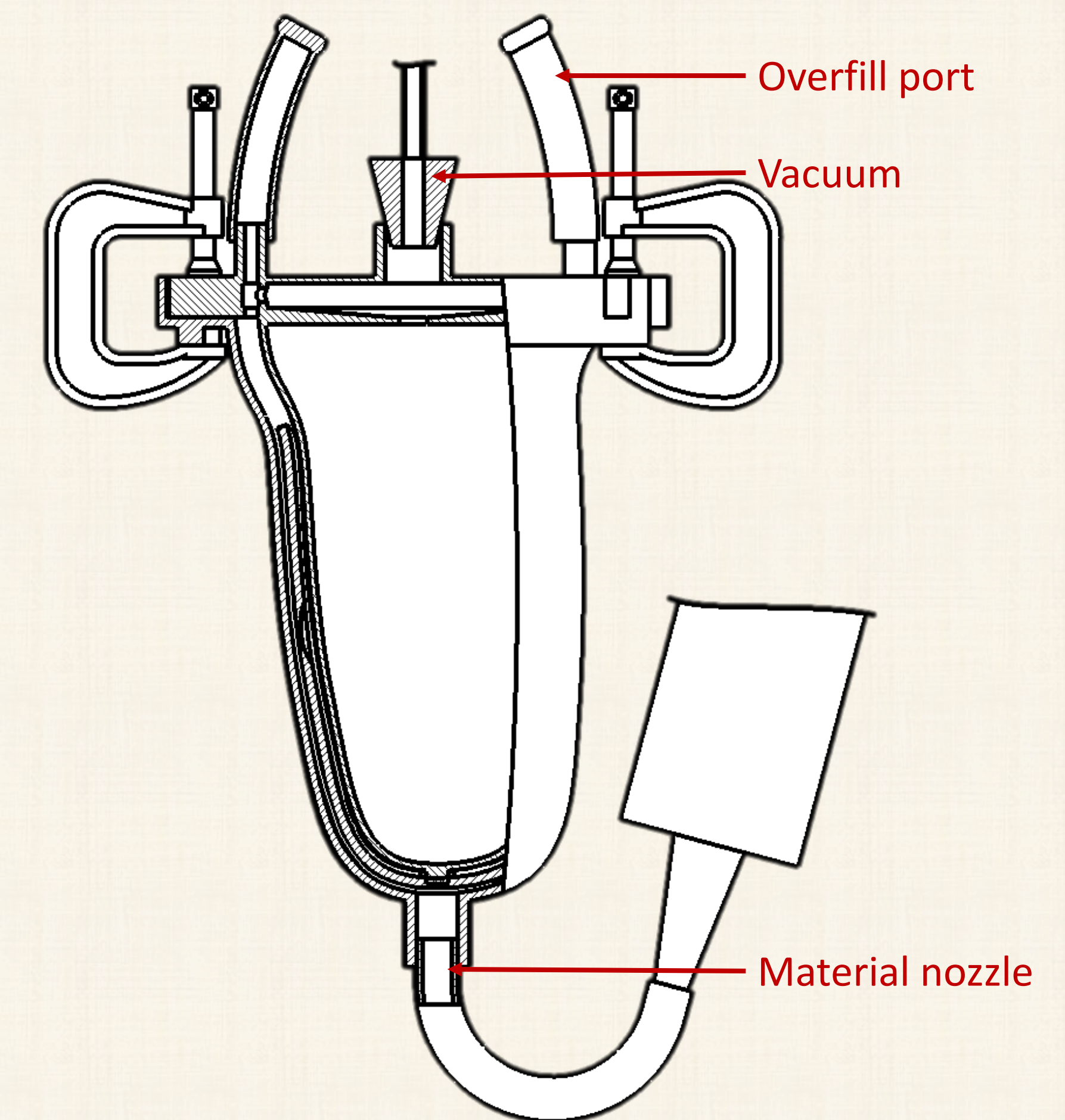
Fabrication in Stratasys Fortus 400mc Fused Deposition Modeler  
Slice height: 0.25 mm; Build material: PC-ABS



### Pour Process

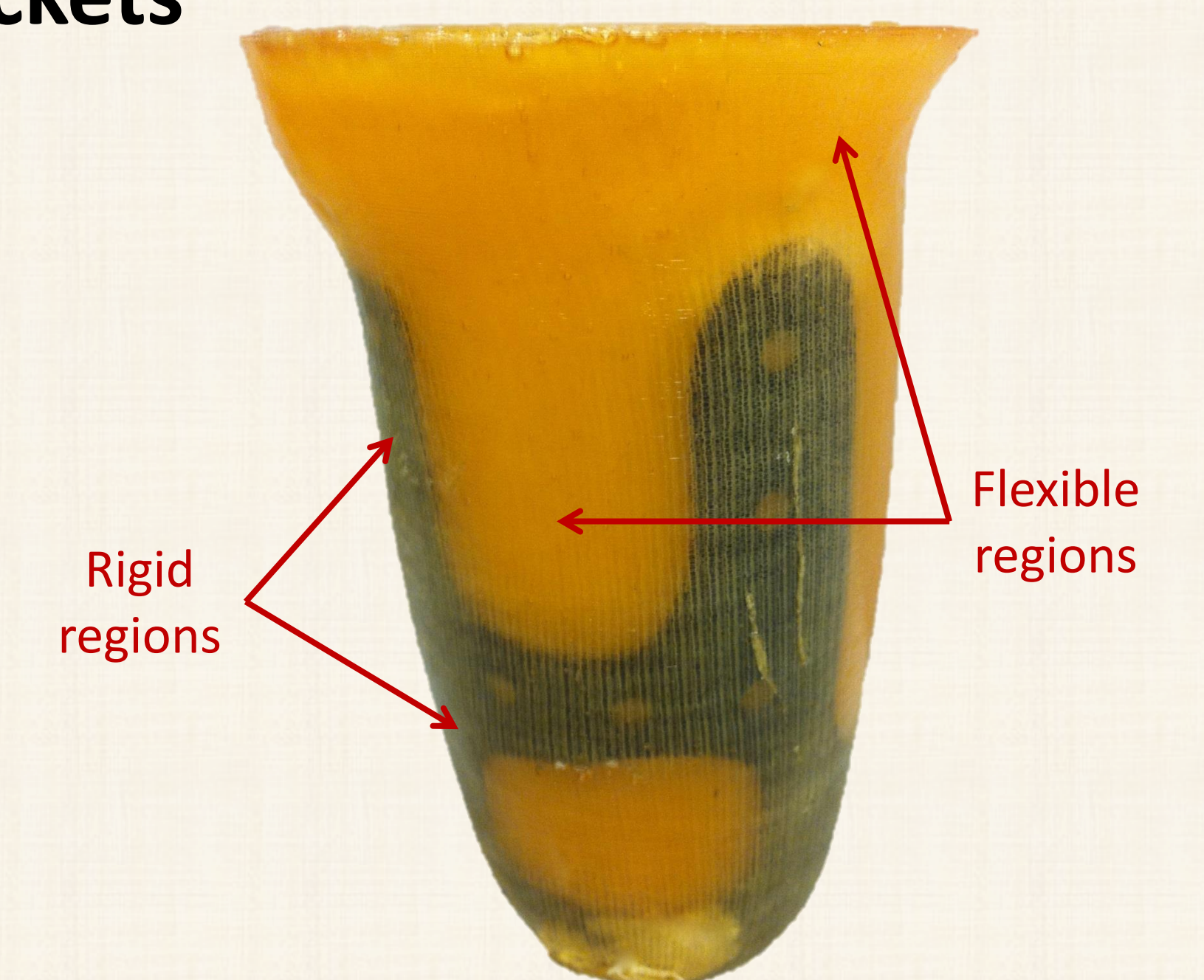
Fabrication of socket with single-shot molding technique

- Flexible material:
  - Fibre Glast Urethane Casting Resin
- Vacuum pressure:
  - Prevents air bubbles and air pockets
- Overfill ports:
  - Ensure complete saturation
- Pour time:
  - 5 minutes to pour
  - Overnight cure



### Results: Fabricated sockets

- Minimal air bubbles
- Minimal air sockets
- No issues with demolding



## Conclusions

The single-shot molding process designed to fabricate a two-layer prosthetic socket has demonstrated feasibility, but the socket's clinical applicability remains to be determined. The next steps in the project include the following: material and failure testing on the rapid prototyped socket with results compared to a manually fabricated socket.

### Funding Acknowledgement

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