3D Printing Transradial Prosthetic Diagnostic Sockets

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Background

How are prosthetic sockets made?

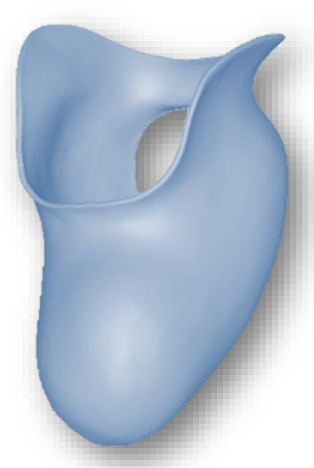
Traditional	Digital
Cast	Scan
Manually Rectify	Digitally Rectify
Fabricate Diagnostic Socket	3D Print Diagnostic Socket

Challenges

- Digital rectification process lacks physical feedback
- Current 3D printed diagnostic sockets are not suitable for performing clinical assessments
- No known research on transradial (below-elbow) sockets

Objective

Develop a process to digitally design and create transradial prosthetic sockets



Methods

Improve Digital Rectification Process

- Refine Software Steps
- Analyze Socket Shape
- Repeat to Automate
- Fit on Clients

3D Printing Diagnostic Sockets

Objectives:
- Rigid
- Transparent
- Thermoformable

- Modify parameters to achieve Objectives
- Collaborate with HB Orthotics and Prosthetics Department for qualitative feedback

The use of Digital Technologies, such as 3D scanners, CAD software, and 3D printing, have the potential to revolutionize traditional prosthetic practice

Holland Bloorview Kids Rehabilitation Hospital

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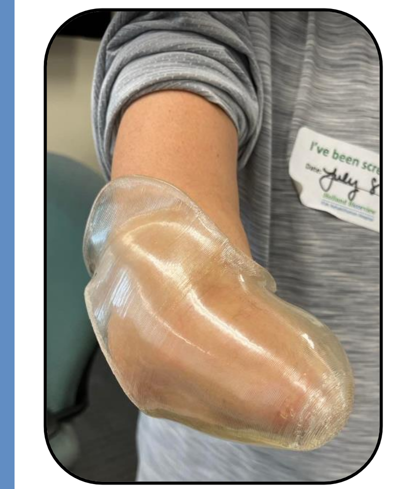
Results/Discussion

Preliminary Analyses Reveal:



- **Time**: Software automation reduces # of steps for basic modifications
- **Socket Fit**: Software still requires refinement for areas of compression/expansion

20+ Diagnostic Sockets were printed while varying the following printing parameters:

Material	Socket Thickness	Post Processing
PLA, PVB, PETG	1.5mm-2.5mm	Chemical Treatment

- Average Print Time: 5 Hours
- Material Cost per printed socket: $5-$15

Feedback from Prosthetists:

- 2.0mm-2.5mm provides the rigidity needed
- Clarity improved. Skin blanching is visible
- Material reacts to heating and adjusting very well

Next Steps

- Improve digital rectification process so prosthetists can easily incorporate it into clinical practice
- Continue testing 3D printed sockets on clients

Impact

- First ever clear, thermoformable, 3D printed transradial diagnostic socket
- Digital Technologies have the potential to significantly improve access to prosthetic services (i.e., remote care, lower costs)
- ***Discover for Action***: HB clients will participate in development of a first-of-its-kind digital process for the creation of transradial sockets

Acknowledgements

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