

3D Printing is Coming to Our Clinics

The Question is...
'Who's Bringing It?'



By: Brittany Pousett, M.Sc., CP(c)

3D printing has become a hot topic in the world of prosthetics. In the last few years, industry news has been filled with stories of groups that are exploring the application of 3D printing techniques to the field of prosthetics.

These stories often seem to involve university students, hobbyists, engineers, designers and others outside of the prosthetics and orthotics community who, just like us, are eager to use their skills to help people. Several of these groups are using 3D printing to help increase access to prostheses in the developing world while others are using it to provide lower cost options to patients who can't afford them.

Now that 3D printing is gaining more publicity, many of our patients have begun to ask us why we don't use 3D printing in our prosthetic clinics. As professionals who are responsible for our patient's safety, we have valid concerns about the strength, reliability, comfort and durability of using a new method of manufacturing. But, while many might think of 3D printing as a new technology in the world of prosthetics, it actually started in 1990, when a group from Northwestern University's Medical School was experimenting with using rapid prototyping methods to make prosthetic sockets [1].

Since then, groups from all over the world have explored the application of 3D printing to prosthetic devices. One of these groups is a pair of certified prosthetists in the U.S. who are successfully using this technology in their practice. They've found this technology to have benefits when used to make diagnostic sockets for their patients (<http://www.additiveoandp.com/home.html>).

We at Barber Prosthetics Clinic were inspired to see it for ourselves. We didn't want to overlook a valuable addition to our repertoire of manufacturing methods if it could provide us and our patients with some benefit. This led us to purchase our own 3D printer and begin printing sockets in our clinic.

Many people outside of the field of prosthetics believe that 3D printing is as easy as scanning a limb and pushing the print button on a 3D printer. It's not that easy! In order to create sockets that are suitable for patient use, there are a number of decisions to be made regarding the structural design of the 3D printed socket, the printer parameters, and more.

If we, as certified prosthetists, don't get involved in the develop-

ment of this technology from the beginning, others will continue to develop it for us and continue to introduce the idea to our patients. That is why Barber Prosthetics has committed to being involved in the research behind 3D printing socket technology. As certified prosthetists and registered technicians, we bring an expertise to the design, manufacturing and fit of prostheses that no one else can. We need to be involved in conducting the research to apply our expertise and shape the objective science behind this technology in order to determine if it is safe and suitable for our patients. If the research shows that it is suitable, we need to lead the way in demonstrating how this technology can be successfully implemented into our clinical practice in a way that

complements the traditional way of doing things.

This brings us to the first limitations we want to address – how strong are 3D printed sockets? At first glance, they appear to be quite strong – but how do you know for sure? This is the most significant limitation we have encountered when exploring new socket materials as there is no standard on how strong they must be to be used by our patients outside of our clinics.

To address this need, we partnered with a team from the British Columbia Institute of Technology and a Biomedical Engineering student from Universidad Iberoamericana in Mexico City. Together, we are working on applying the ISO standard of lower extremity prostheses to socket strength testing in order to compare the strength of conventionally-fabricated sockets to those printed with 3D technology. We are in the midst of testing but are excited to share the results. Stay tuned for more information on if, and how, 3D printed sockets could become part of your prosthetic treatments in the future!

Reference:

[1] Herbert N, Simpson D, Spence W, Ion W. A preliminary investigation into the development of 3-D printing of prosthetic sockets. *Journal of Rehabilitation Research & Development*. 2005; 42(2): 141-146.

About the Author:

Brittany Pousett, M.Sc., CP(c), is a certified prosthetist and the Head of Research at Barber Prosthetics Clinic in Vancouver, B.C. She has a Bachelors of Science in Biophysics from the University of British Columbia and a Masters of Science in Rehabilitation from McMaster University. Pousett is passionate about integrating research into clinical practice in order to provide her patients with evidence-based care.

