providing a weight bearing shape capture and concurrent AFO alignment. Using the correct scanning platform can potentially reduce the time and cost of production while enhancing the patient's experience by providing a more comfortable and precise fit. This provides insight into another area of general concern when it comes to digital design of AFO's.

Disclosure: Richard Miltenberger is a paid consultant with Mecuris, GmbH. The Mecuris software in some form may be shown during the presentation for illustrative purposes but is not the central concern of this presentation.

Prior work:

1. Tri-planar Scanning Platform. Comb3D https://www.combscan.com/fixture
2. Techmed https://techmed3d.com/product/maid-standard/
3. Biosculptor https://biosculptor.com/?page_id=7579
4. Thuasne https://bmiortho.com/images/3D-Scanner_External-Use.pdf

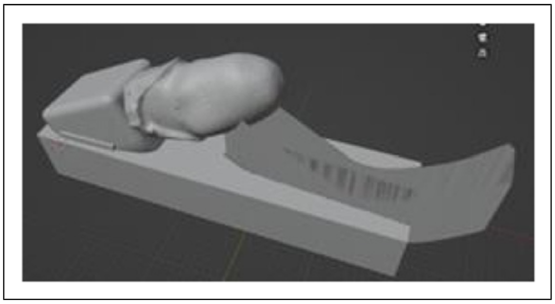

Figure 1. Boolean subtraction of the "socket interlocking element" and foot from the full box.

A digital process to replicate the socket and the foot alignment in below knee running specific prostheses

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Introduction: A well fit socket and a fine-tuned foot alignment are crucial elements in a running-specific prosthesis to allow Paralympic athletes to express their full competitive potential. For this reason, once a satisfactory socket-foot configuration is established, it would be beneficial to reproduce the same conditions when renewing the prosthesis or to further improve the set-up through small adjustments in a very controlled manner. At present, this requires elaborated bench procedures (e.g. through custom adaptations of transfer devices to accommodate sprinting specific running blades), which are prone to manual error, cumbersome in use and possibly leading to socket damages or destruction.

In this study, we propose an original digital CAD/CAM workflow that allows replicating the full alignment of transtibial and partial foot sprinting prostheses, implementing controlled quantitative adjustments to the configuration, or performing socket adaptations.

Methods: The method requires a digital scanning system, a 3D mesh editing software and a milling machine or 3D printer.

The workflow consists of six phases:

1. Scanning the inner part of the socket and the foot, correctly assembled. Due to scanner limitations, these elements might need to be digitized with

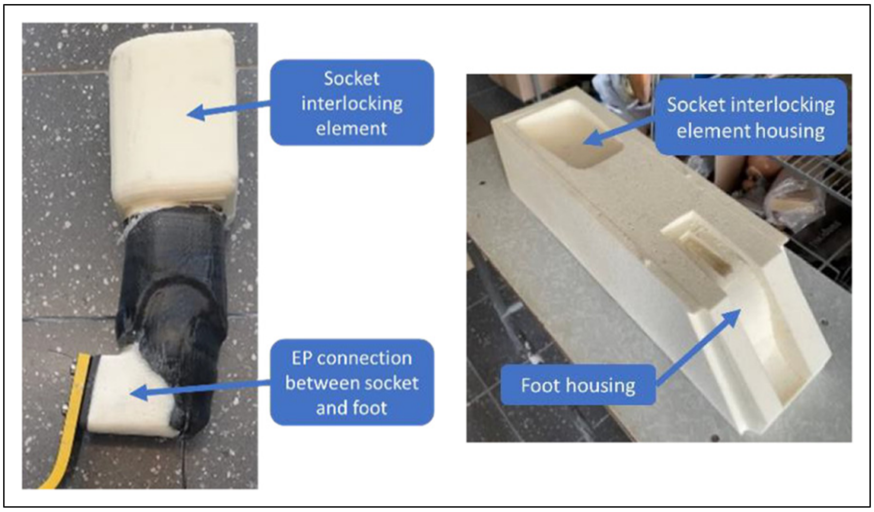

Figure 2. Socket interlocking element (on the left) and alignment box (on the right) obtained with a milling machine.

different devices or in separate sessions. To allow spatial registration of the two meshes, it is essential to have a common element visible in both scans.

2. Rigid spatial registration between the two scans is performed using geometrical features detected on the common element.
3. If necessary, socket modification or alignment adjustments can be virtually completed in the 3D software taking full advantage of accurate computational geometry tools.
4. A “socket interlocking element” is generated in a 3D software and it is connected to the socket mesh through Boolean operation.
5. An “alignment box” is designed in the 3D software from a full box by Boolean subtraction of the foot and of the socket interlocking element (Figure 1).
6. Fabrication of the socket with its interlocking element and of the “alignment box” using a milling machine or additive manufacturing techniques (Figure 2).
7. The socket is laminated leaving its interlocking element unaffected; the foot connector is screwed on the foot.
8. The socket interlocking elements and the foot are physically positioned in the dedicated housings of the alignment box.
9. A physical connection between foot and socket is created by following the typical procedure of pouring expanded polyurethane (EP) between the two.

Results: This procedure was successfully adopted to replicate the alignment of the prostheses of 5 athletes of the Italian Athletics Paralympic Team and proved to be applicable in 4 different types of running blades, namely Ossur Xtreme, Xcel, Xpand and Ottobock Sprinter.

Conclusion: The workflow addresses an unsolved issue in the construction of sprinting specific prosthesis, which can be easy to replicate in O&P services equipped with 3D scanners and a 3D printer or milling machine. The outcome proved to be a reliable method to replicate an existing socket and its alignment relative to the foot, or to perform corrections in a very controlled manner.

Significance: The study suggests an innovative method to overcome the existing difficulties associated to socket-foot alignment replication in sprinting specific below knee prosthesis.

Disclosure: None.

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Aether digital platform: The role of cloud-based software to enhance data efficiency in myoelectric hands

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Introduction: Myoelectric prosthetic technology first became used in rehabilitation centers around the world in the 1980’s[1]. Even though the systems have advanced they are still very uni-directional with no integration into the digital ecosystem. Information is given from patient to device but no data is being transfered back to the patient or the clinician. With the recent advancement with myoelectric hand technology - we have not seen the same level of advancement being achieved at the software level. The objective of this presentation is to demonstrate examples and the powerful role that a cloud-based digital platform incorporating machine learning, AI, and IoT software technology can can play in enhancing myoelectric hand data efficiency.

Methods: Built a cloud-based digital platform software (Aether Digital Platform) with the vision of supporting end-to-end patient journey in a data-driven manner. Components of the digital platform include web-based clinician facing software, mobile patient facing application, multi-articulating myoelectric hand (Zeus,hardware), device usage monitoring device (hardware), which all interact with each other. Sucessful integration makes the digital platform a breeding ground for innovation[2]

Results: The primary objective that we set out to achieve with the Aether Digital Platform was to 1) provide device usage monitoring data to clinicians and support them in delivering outcome-driven care. 2) support traceability in parameter changes associated with setting up the Zeus multi-articulating myoelectric hand. 3) reduce physical barriers between patients and clinicians and allow interactive changes in the parameters of prosthetic devices, remotely (IoT). The digital platform format promises a number of benefits by encouraging integration among devices allowing for increased continuity of care.

Conculsion: The field of upper extremity myoelectric prosthetics would benefit from adopting a cloud-based digital platform to enhance the continuum of patient care and the possibility of an alternative reoccurring revenue stream.

However, we do not have the current infrastructure for widespread adoption across all myoelectric hand hardware devices - this technology will be advancing and expansion is on the horizon.