

# Tech Update

## Prosthetics for Pediatric and Adolescent Amputees

The prosthetic needs of pediatric patients require the skill and expertise of practitioners who not only are knowledgeable about the factors unique to that age group, but have the capability and experience to treat these cases.

The certified professional staff at Muilenburg Prosthetics Inc. (MPI) are the region's experts in providing pediatric prosthetics with a history of patient care of more than 60 years and a mission to restore a child to the highest level of mobility possible.

Through the years, MPI has developed a close association through clinics with Shriners Hospital - Houston, TIRR, and Texas Children's Hospital, in providing care for pediatric patients who have limb loss through trauma, disease, or birth defects. We also specialize in fitting those who have undergone the Van Ness Rotationplasty. Staff practitioner time is dedicated after clinics to discuss cases - what works, what doesn't and ways to make prostheses last longer and provide more comfort, mobility, and the best possible outcome for the child.

Special components need to be selected to meet the rigorous activities and expectations that the child will be capable of as they grow and develop in the future. Manufacturers typically group the components for pediatrics, adolescent or adult. Most have weight ratings but only experience can determine whether they will hold up to their activities. On many patients, it is advised that adult components be used as soon as size permits. Even then, component limitations are often pushed to the limit by children.

Over the years, MPI has developed a process to structurally fabricate a prosthesis in-house and fit the socket so the child can grow into the socket, resulting in fewer



adjustments and less immediate urgency for adjustments or a new prosthesis. This greatly reduces the frequency of replacing a prosthesis because of structural failure or severe pain from the socket not being fit to accommodate for their growth. With a lower extremity

prosthesis, our patients often get at least one and a half years of use. With an upper extremity prosthesis, the time frame is longer, and often only the socket is replaced with the other components refurbished and refitted to the patient.

During the past quarter century, most changes and modifications in children's prostheses have occurred with endoskeletal components, contributing to the highest possible quality of life for young amputees. Very few pediatric knees are available with hydraulic knee control. Most adolescent knees are.

### Feet

The smallest and simplest prosthetic foot is a solid ankle cushion heel (SACH) foot. The SACH foot heel compresses, simulating ankle motion and its solid-ankle keel provides support when the foot is flat on the ground. The foot attaches with a single bolt, allowing it to be easily replaced if it breaks and also allows the prosthesis to easily be lengthened as the child grows. A SACH foot is fabricated in child size 3 (10cm) and larger.

The Seattle Systems Child's Play® Foot has a dynamic response Delrin keel, which offers shock absorption and a smooth

rollover for a natural gait. Its sculpted cosmesis varies by size to reflect the natural appearance of a child's maturing foot. The Child's Play Foot is appropriate for all lower limb pediatric amputees, including Symes. It is available in sizes for body weights up to 144 lbs., and in darker skin tones.

The College Park TruPer® foot is a multi-axial, dynamic-response foot made specifically for pediatric patients. It can be fitted to children as young as 3 years old.

The TruPer also incorporates a foot shell with a split toe so children can wear shoes and sandals of their choice.

Ideal for youngsters weighing 33-100 lbs., Flex-Foot® Junior provides energy

return. The CarbonX Active Heel® stores energy and absorbs shock loads, and the carbon fiber layering technique of the toe is specifically designed to offer the support and flexibility needed for the varied movements of children. The foot shell features a sandal toe shape.

### Knees

Otto Bock's 3R38 is the smallest single axis children's modular knee joint. It has an adjustable extension assist to provide additional security. For weights up to 99 lbs.

DAW offers a variety of sizes available in children's componentry. DAW's single axis and polycentric knee joints are made of lightweight carbon graphite materials with ball bearings.



Above-knee prosthesis with Otto Bock 3R38 knee and 10 cm SACH foot for a one-year-old.

*continued on back*

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Ossur's Total Knee® Junior is made of lightweight, extremely durable aluminum, and weighs only 0.745 lb. The inventor was Finn Gramnas, who was inspired by his six-year-old daughter struggling to walk without falling while wearing a heavy and clumsy prosthesis. He invented the Geometric Locking System that offers extra security and stability, even on hills, which is achieved through the knee's seven-axis polycentric design. Only two-thirds the size of the award-winning Total Knee, it has all the important features, plus color. Designed for children weighing up to 100 lbs.



Fillauer-Hosmer MightyMite® 4-Bar Knee. Small-sized, stable polycentric componentry withstands the high impact activity of an older child weighing up to 132 lbs. without incurring the bulk and weight of adult parts. Ideal for those playing sports.



## Upper Extremity Prostheses

Upper extremity prostheses are fit to children on a less frequent basis as they quickly learn how to adapt to their environment without a prosthesis.

Twenty-five years ago, there were no small electric or mechanical hands. Consequently a prosthesis was commonly fitted with a hook terminal device. These

prostheses worked well and the same style of prosthesis could be maintained into adult life.

Today, virtually all pediatric prostheses are fit with body powered, electric or hybrid design with hands. The hands work well for children, where with adults, when work or hobby activities become a priority, the hook style often takes preference due to it being lightweight, easy to operate, functional for holding a wide variety of objects, and durable.

The Steeper mechanical hand is the smallest and can be fit to a child as young as 1 year old. It has a positive lock for carrying objects and adjustable grip force. Steeper also makes an infant and child friction elbow for passive or electric hands.

The Otto Bock System Hand can be fit to a child as young as 9 years old. It has a flexible outer covering and is available in the mechanical or passive style. The passive style is unique in that it can be opened with the sound side and closes under spring tension to hold objects.



Top: A below-elbow prosthesis for a 2-year-old with a Steeper mechanical hand. Below: An above-elbow prosthesis for a 6-year-old with a VASI myoelectric hand and child's Steeper friction elbow.



Passive hands of other manufacturers are available that can closely match the appearance of the other hand. Passive prostheses are often used due to their cosmetic appearance but the additional function gained by them extending the limb to the appropriate length should not be overlooked.

The VASI series of electric hands, which can be myoelectrically controlled, are known for their quality and reliability, and have been designed for limb-deficient children from infants up to age 11. The hands are aesthetic and lightweight, yet can withstand the rigors of child play because of injection molded construction techniques.

A new System Electric Hand, size 7, from Otto Bock for adolescent and small-framed adults is perfect for the active child due to its rugged design and adult function. It is available in myoelectric Digital Twin or Dynamic Mode Control.

MPI works closely with the child and parent, physician, therapist, primary caregiver, and other specialists to establish and achieve treatment goals, ensuring the child receives the best prosthetic solution.



A long-time MPI upper extremity myoelectric patient poses with a photo of herself as a child.