



MOVING AHEAD

A Swanson Regional Orthotic & Prosthetic Research Center Publication

No. 44

Pediatric Orthoses

We devote this issue of our newsletter to the unique aspects of providing orthotic devices to children. From a biomechanical and design perspective, working with kids draws on the same

orthotic principles as for adults; indeed, the spectrum of orthotic appliances includes relatively few systems designed specifically for pediatric applications. Many of these are detailed on the inside pages.

As with prosthetics, the caveat *Children are not small adults!* clearly applies to orthotic management—kids present unique opportunities and challenges, which are discussed below.

On page 4, we highlight new orthoses

for managing tortocollis and positional plagiocephaly.

We hope you find this presentation enlightening and welcome your questions and comments.



SWASH orthosis

What's Unique About Bracing Kids?

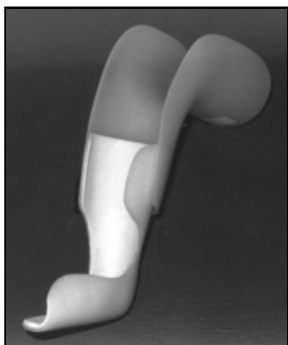
The orthotic management of children involves most of the same objectives, design fundamentals and materials as for adult patients; however, the same growth and development issues that define how we interact with infants, toddlers and older juveniles also apply to the process and methods by which we provide rehabilitation componentry.

The overall goals are essentially the same: Prevention and/or correction of deformities and functional improvement. Often, the desired outcome can frequently be achieved with scaled-down versions of adult appliances; nevertheless, providing pediatric orthoses calls into play certain special skills and considerations, which add some complexity to the process but frequently with commensurate professional reward.

Space limitations preclude a lengthy discussion of this topic, but here are some unique aspects orthotists encounter in managing children:

• **Custom vs. off-shelf.** While some popular devices such as the Pavlik harness, orthopedic shoes and night splints are primarily prefabricated components, pediatric orthoses tend to be more custom-made because of the reduced tolerance for error corresponding to the child's stature and smaller area on which correctional forces can be focused.

Orthotics Today



Wheaton brace

• **Growth.** The propensity of a child's bones and muscles to grow non-synchronously challenges orthotists to incorporate design features that will sustain productive orthotic forces over time while maintaining range of motion...and remaining on speaking terms with parents, HMOs, and others who write the checks.

• **Developmental age.** Each child presents with his/her unique combination of motor development, cognitive and adaptive

(Continued on page 2)

About Moving Ahead

Moving Ahead is a professional newsletter published by Swanson Regional Orthotic & Prosthetic Research Center to inform health care professionals of developments in the orthotic and prosthetic disciplines.

Swanson offers four board-certified practitioners and three state-of-the-art laboratories. The centers have a solid reputation for quality care and patient satisfaction throughout northwest Ohio and southeast Michigan and has been in business for more than 21 years.

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Compliments of: Vern Swanson, C.P.; Jeffrey Kuehn, C.P.; and Jon S. Eberlein, CPO.

Pediatric Orthoses – From Hip Dy

The following selection represents the bulk of orthotic componentry employed in contemporary management of juvenile patients. While some also have adult applications, the majority of these designs are primarily prescribed for children.

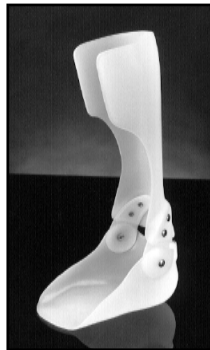
If you have an interest or questions regarding a particular orthosis presented, or excluded, here, please call our office.

Ankle Foot Orthosis (AFO)

Application: Varum and valgus deformities

Description: Custom-fabricated thermoplastic, metal or composite device designed and trimmed for a patient's unique needs

Function: Provide proper alignment, limit or encourage ankle motion



Counter Rotation System

Application: Internal tibial torsion, maintenance of post-operative clubfoot or metatarsus adductus correction

Description: Plastic multihinged orthosis with bilateral footplates; three hinged joints and eight circular rotation joints

Function: Hold feet in corrected external or internal rotated position while allowing independent leg movement and free hip and knee motion

DAFO - Dynamic Ankle-Foot Orthosis (also called Tone-Reducing AFO and Total Contact AFO)

Application: Cerebral palsy, hemiplegia, spastic diplegia

Description: Thin, flexible, molded thermoplastic orthosis covering the entire foot; custom-contoured footplate; designed to distribute weight-bearing forces over large area

Function: Reduce ankle hypertonicity, increase ankle stability and provide proper alignment



Developmental Dysplasia of the Hip (DDH) Orthosis

Application: Hip dysplasia in children beyond pre-walking stage

Description: Pelvic band connected to thigh cuffs by aluminum joint with 20 degree extension stop and 90 degree flexion stop or free motion

Function: Provide positive abduction positioning



Componentry Capsules

Floor Reaction Orthosis

Application: Cerebral palsy "crouch gait" - Knee instability

Description: Rigid thermoplastic or laminate AFO with neutral ankle position and a broad anterior panel just below the knee

Function: Apply knee extension moment during stance phase to prevent knee buckling and excessive flexion associated with crouch gait



Knee-Ankle-Foot Orthosis

Application: Hemiplegia, c lower-limb instability and

Description: Primarily the laminated brace extending to footplate, typically incorporating knee and/or ankle joint

Function: Control motion, ment of the knee and ankle

Orthopedic Shoes

Application: Correction and accommodation of foot deformities

Description: Specially shaped extra-depth design

Function: Accommodate internal modifications

Parapodium

Application: Paraplegic p astic cerebral palsy; my

Orthotic Considerations for

(Continued from page 1)

function, and learning ability (possibly retarded by disease process). This set of variables challenges the orthotist to provide componentry suited to the patient's capacity to benefit from it.

- **Communication.** Very young and some older developmentally impaired children are often unable to verbalize pain or describe problems with the way an orthosis fits or feels. Further, young patients cannot be expected to understand or remember details of application, schedule, skin care, orthosis care, etc. Thus, the orthotist is called on to employ special skills of observation and communication with the child and parents to realize the intended benefits from orthotic intervention.

- **Weight.** Plastics and other synthetic materials are typically chosen over metal and other heavier choices to make the orthosis as absolutely lightweight as possible. Minimizing weight while incorporating sufficient durability to withstand the

stresses imposed by an act challenge.

- **Finishing Enhancem** finishing, as with cartoon make orthosis wear signif to a younger child. Other braces to be worn under c normal-appearing shoes— therefore acceptance amor conscious, pre-teens and a

- **Family Support.** The viewpoint and responses v from infancy to adolescen family participation in the remains critical througou can be expected to carry o the orthotic plan independ

Our orthotic staff is wel in working with pediatric inquiries and referrals.

Spinal Braces to Scoliosis Jackets

KFO (KAFO)

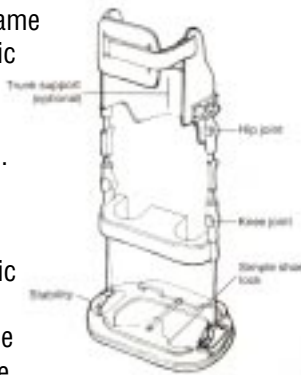
Paraplegia, deformities
Thermoplastic/
from thigh
incorporating a

and align-
e



Description: Aluminum frame incorporating thermoplastic footplate, foam knee block, hip and knee locks, and chest and back panels. Three-point system keeps patient upright.

Function: Enable paraplegic children to stand without crutches; prevent or reduce flexion contractures. Those with good torso control can achieve pivot gait and independent mobility.



Foot orthoses, AFOs and

patients 3 years and older;
hemomeningocele

Children

ive child adds to the

ents. Colorful, creative
or action figures, can
icantly more acceptable
techniques—designing
othing or to fit into
-enhance body image and
ng older, appearance-
-adolescents.

ough a child's abilities,
will vary significantly
ce, active parental and
orthotic intervention
nt. Few pediatric patients
out the at-home portion of
tently.

ll-trained and experienced
patients. We invite your

Pavlik Harness



Application: Hip dysplasia, including congenital hip dislocation, in infants of pre-walking age

Description: Shoulder harness with anterior and posterior straps extending from chest strap to stirrups

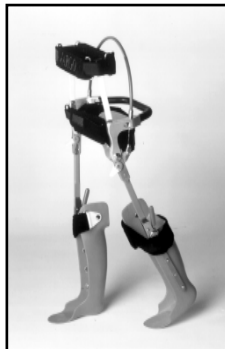
Function: Hold hip in flexion-abduction attitude while allowing movement within acceptable limits

Reciprocating Gait Orthosis

Application: Lower-body neurologic impairment: Indicated in L1 to L3 lesions in children with functioning iliopsoas and hip adductors

Description: HKAFO incorporating cable system or similar method of mechanically translating hip extension on one side into hip flexion on the contralateral side

Function: Provide standing and ambulation ability, thereby raising physical and psychological horizons



Scoliosis Jacket

Application: Idiopathic scoliosis

Description: Custom thermoplastic TLSO

Function: Limit curve progression and need for surgical correction

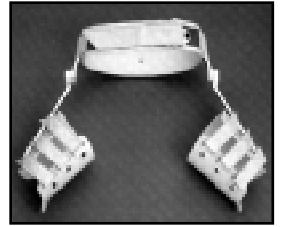


Scottish Rite Orthosis

Application: Legg-Calve-Perthes disease

Description: Lightweight orthosis consisting of metal pelvic band, plastic thigh cuffs, aluminum hip joints with thrust-bearing hip joints or a telescoping spreader bar (older design)

Maintain hips in abduction containing femoral head in the acetabulum



SWASH - Standing, Walking and Sitting Hip Orthosis (See photo page 1.)

Application: Cerebral palsy; any child whose adduction and/or internal rotation at hip joint interferes with function or induces lateral migration of the femoral head

Description: Plastic padded waist band and two joint assemblies connected by shaped leg bars to adjustable plastic thigh bands

Function: Stabilize hip and oppose excessive adduction and internal rotation; reduce scissor gait while walking and improve balance while standing

Tibial Fracture Orthosis

Application: In lieu of plaster cast to provide greater freedom of activity during healing, reduced muscle atrophy and shorter disability time

Description: Total contact, usually thermoplastic, brace with plastic or metal ankle joints and heel insert. Most often custom-molded for pediatric applications

Function: Allow mobilization of the leg during fracture healing; minimize rotation and shear forces; support tibia and fibula



Wheaton Brace - (See photo page 1.)

Application: Metatarsus adductus; clubfoot; tibial torsion. Used in place of serial casting or corrective shoes

Description: Molded thermoplastic and Velcro knee-ankle-foot orthosis

Function: Applies direct corrective rotational force on the tibia without any torque on the femur or hip.

New Head Orthoses for Young Children

Torticollis Orthosis

Congenital muscular torticollis or sternomastoid torticollis, is a common musculoskeletal anomaly in which the head is tilted to one side and rotated in the opposite direction due to a congenital shortening of the sternocleidomastoid muscle. The condition becomes apparent shortly after birth and is also known as “wry neck” syndrome.



The causes of torticollis may be genetic, acquired, or idiopathic and may also develop later in childhood or adulthood. Acquired torticollis, much more difficult to treat, results from damage to the muscular or nervous system due to trauma or disease.

In most cases surgical release of the tight sternocleidomastoid muscle is indicated fol-

lowed by aggressive physical therapy to stretch the contracture.

Surgeons often are interested in orthotically managing the deformity by gradually moving the head into the correct position. A new torticollis orthosis now available from Fillauer gives clinicians the ability to maintain the head in any position desired with respect to cervical flexion, abduction and transverse rotation. This device is easy to don and doff, comfortable for the patient to wear, and allows multiplane positional adjustments.

What's New

Cranial Remolding Helmet

The STAR band (Symmetry Through Active Remolding) is a custom-made cranial orthosis used for the treatment of positional plagiocephaly—head asymmetry that resembles a parallelogram when seen from the top. The ear on the side of the flattened area is located more anteriorly than the ear on the contralateral



side, and there may be a slight bulging of the frontal area on the flattened side. This condition is often associated with supine positioning during infancy as recommended by the American Academy of Pediatrics to avoid sudden infant death syndrome (SIDS).

This orthosis provides corrective forces on the child's skull, which will help promote facial and skull symmetry while improving skull shape.

The Star band is used to treat children 3-18 months old. The helmet is fabricated from a positive mold of the patient's head modified to a symmetrical shape. This approach allows forces on the areas in contact with the helmet and spaces for the head to fill in during the growing and remolding process. The STAR band is contraindicated for hydrocephalus and craniosynostosis.

For more information on these new orthoses, please contact our office.

Note to Our Readers

Mention of specific products in our newsletter neither constitutes endorsement nor implies that we will recommend selection of such products for use with any particular patient or application. We offer this information to enhance professional and individual understanding of the prosthetic and orthotic disciplines and the experience and capabilities of our practice.

We gratefully acknowledge the assistance of the following resources in compiling and illustrating this issue:

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