



## Bracing for Adults

Although at Cascade a large focus of our work is on helping young children with mobility challenges, we do indeed make braces for and work with many adults. Patients mature and many of them, although larger in size as they grow, still need the support provided by a DAFO brace. Additionally, the onset of many mobility challenges, such as complications from a stroke, can happen later in life.

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### Cascade Dafo, Inc

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## Patient Case History- Kelly

Kelly is an 8-year-old girl with cerebral palsy spastic quadriplegia as a result of complications from prematurity. She uses a prone stander and gait trainer at home and at school. After her family moved to our area, they had to wait on insurance authorizations for new services. During that time, Kelly outgrew her solid AFOs and she regressed functionally without treatment. Kelly developed rapidly progressing contractures and deformity while out of braces, due primarily to her extremely high tone. Her increased muscle tone prohibits volitional movements, even though she takes an oral medication to reduce tone.

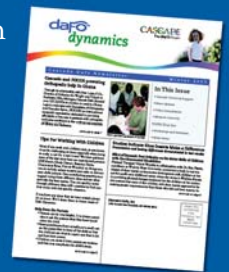
I began seeing Kelly as a patient 10 months ago, at which time, she had been without

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## 2 Patient Presentation - Excessive Plantarflexion

In our Winter 2006 Newsletter we introduced our approach for working with how patients present and some guidelines for selecting the most appropriate brace. We will be covering each of the seven patient presentation groups in our newsletter, one at a time.



Note lack of heel contact during gait.

The traditional approach to brace selection at Cascade has been to assess each patient's presentation from the bottom up, looking first at the biomechanical needs of the foot, then the ankle, and finally the knee as applicable. The final step of choosing a brace, however, has often been difficult for those less familiar with the names and features of our brace designs.

To help assist in the brace selection process, we began to organize patient presentations into groups based on the foot, ankle and knee presentations we most often see in our patient population. Within each group we defined the range of involvement, matching each of these presentations to an appropriate brace design. Directly associating a brace design/bracing strategy with a defined patient presentation has worked well, both in theory and in practice.

We have used our grouping system with the understanding that while

not perfect, it is a reasonable (and clinician friendly) way of approaching the brace selection process. In this issue we will look at Excessive Plantarflexion, or Toe Walking.

### Excessive Plantarflexion – Toe Walking

During the development of standing and walking skills, children will often bear weight on the forefoot without bringing their heels consistently down to the ground. This is commonly referred to as “toe walking” and is a normal part of a toddler's progress toward normal standing and walking. By about age three, children will begin to bring their heels down and to bear weight along the full length of their feet. Their gait will develop into the standard heel-toe pattern of the normal gait cycle.

If toe walking continues beyond age three, if the elevation of the heel off the ground is extreme, or if the child is not able to bring his heels down to the ground due to tightness in the muscles or tendons, a neurological problem may be indicated. A complete medical evaluation should be performed to establish the true etiology of the condition.

Neurological problems can cause chronic or periodic contractures of the calf muscles (*gastrocnemius m.* and *soleus m.*) or chronic contractures of the Achilles tendon. These contractures will pull on the heel, rotating the foot via the ankle into an excessively plantarflexed position. The condition can be unilateral, bilateral, or asymmetrical (both sides affected, one side more than the other), as this is the result of hypertonía. The foot tone likewise tends to be high and will require evaluation for overall flexibility and correction to achieve an improved position.

### Mild Toe Walking

In the mildest form of toe walking, the patient will usually have a balanced foot alignment, will have good ankle range (including near normal dorsiflexion), and will stand with the foot flat, bearing weight equally along the entire foot. When walking is initiated, the stimulation of over-active calf muscles pulls the foot into a slightly more plantarflexed position than normal. This results in a delay of heel strike during the gait cycle. When walking stops, the muscles relax and weight is borne equally along the entire foot.

The bracing strategy consists of 1) correcting foot position as required, 2) limiting plantarflexion while encouraging dorsiflexion to improve heel strike during gait and 3) maintaining ankle range. A DAFO 4 with a posterior strap would be suitable for the smaller patient, particularly during the transition phase of floor-to-stand activities. For the larger patient, a DAFO 3 provides a stronger plantarflexion block while still allowing free dorsiflexion. Both braces provide a full dorsal wrap for optimal foot control.

### Mild-to-Moderate Toe Walking

In the mild-to-moderate form of toe walking, spastic contractures may be

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Patient demonstrates moderate to severe toe walking.

## Letter from Don



*In November, I spent one week on the Big Island of Hawaii helping physical therapist Nancy Bloom-*

*field with some of her more challenging patients. The following are some of my thoughts about working while in the middle of the Pacific Ocean.*

I'm out the door early Monday morning for clinic work. No one is up in the house this early so I find my shoes under a pile of flip flops and beach gear by the door and let the screen door close behind me quietly.

It's about an hour's drive to where I have to meet Nancy, the physical therapist. The highway runs out of Hilo and follows the shore for the first 30 miles before turning west to cross the high ridge of the island. I pass through Papaikou, Honomu, Oakala Paauhau, Honokau, and I try to work out the pronunciations as I drive. I have an FM station from Honolulu tuned in, green mountains to my left, and the blue Pacific on my right to keep me company. At Honokaa, I buy a sack of hot Portuguese donuts and a coffee and spend the last miles to Waimea trying to keep the greasy, sugary mess under some control.

Waimea is ranch country, cool and high, and the mall where I am to meet Nancy has a western theme to the storefronts; it works. Nancy is exactly on time and so begins the end of taking it easy. She has a list of kids to see, the first being right

around the corner. At our first stop are little feet that need careful, precise positioning, from as comfortable and as flexible support as possible.

Except for the breeze through screens and tropical birds outside the windows I could be anywhere. We have used the Softy™ option on this patient before and it has worked very well. I do fresh casts with footplates between two layers of stockinet, positioning carefully while they set.

I like to cast the feet with moderate compression. This compression molds the footplate to the foot and defines the surface anatomy and volume more precisely. A compressed casting doesn't translate into a final brace with compression, so comfort should not be a concern.

Finishing up the order form with color choices, we are off to another setting. It's another classroom with teachers, aides, bulletin boards, backpacks, screens on the windows, a pleasant breeze blowing through, and ocean stretching away as far as you can see. There might be whales and turtles to see for some people, but not for me this day. Another classroom, another patient, and off we go again, eating as we drive. We are a little behind on our schedule but nothing that high speed driving can't fix.

We finished our day on the Kona side at a school that has a large, open, but covered area where the buses and parents come and go. The entire school goes through or alongside this area at the end of the day.

Lots of people stop a few minutes to watch the casting and talk to the kids being casted. This is the best clinical setting I have ever worked in for making these kids, who need DAFOs, feel part of a larger community. How many times can I answer, "what are you doing this for?" before I get tired of explaining? I don't know yet.

Now I get back in the car and have one more home call, up on the mountain in Waimea on the way home before the day's work is done. This home is at the end of a side road and I have to open the gate to drive the last quarter mile to the house. It is a working ranch surrounded by cattle and horses.

The family has a two-year-old boy with very low tone, very pronated feet, an unsteady gait. A pair of precisely fitting and flexible DAFO 4 SMOs, with horses on the straps, should work as well in Waimea as they do in Warrensburg, so I get that done. I open the gate to leave, close it behind me, and begin down the highway to Hilo that is starting to light up in the gathering dusk. What have I learned?

In every place that people live, you will find families that have children that can be helped with carefully conceived and applied braces. This is demanding work and even in paradise, a cup of coffee on the last leg home is refreshing and comforting as I turn on the wipers to clear away the beginning of the evening's tropical shower.

## News Items

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### New MPE Plastic on DAFO 8

As part of our Continuous Improvement program (see Winter 2006 Newsletter), in the fall of 2005 we began using a clear MPE plastic on the DAFO 8, instead of the white opaque TPE plastic. The MPE plastic has the same feel and performance, and makes for more accurate and efficient manufacturing.

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### New Logo for Softy Product Line

Check out the new name and logo for the Cascade Softy™ product line. Using a Cascade Dafo proprietary manufacturing method, the Softy incorporates a dense cushioned liner with a variety of DAFO braces. Visit [www.dafo.com](http://www.dafo.com) for more information about the Softy product line.



### Helping Patients Find Qualified Providers

To help families and patients find qualified providers near their home, later this year Cascade will offer a ZIP code locator on the [www.dafo.com](http://www.dafo.com) website. As part of the Cascade Care Provider Program, the locator will list practitioners who have attended a Cascade Dafo Bracing Workshop, and have utilized DAFO braces. Patients will be able to input a ZIP code to find a list of qualified providers in their area. Watch the website and upcoming newsletters for more information about the Cascade Care Provider Program.

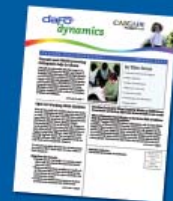
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### Newly Improved PollyWogs

At Cascade, we are always looking for ways to improve our products and better help patients. As part of that focus, we recently updated the PollyWog shoe insert line. We have created a whole new set of molds with a variety of enhancements providing a little more support, improved fit, and higher level of function. One feature your patients will notice is the more substantial arch support. Order forms and pricing remain the same, but the products are improved for your patients' benefit.

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## Patient Presentation - Excessive Plantarflexion continued from page 2

chronic and/or moderately strong. Foot alignment may be affected by mild to moderate high tone pronation or supination. Ankle range may be limited, but can still be corrected close to 90°. When gait is initiated (no brace), the patient's foot is pulled into plantarflexion and does not make initial floor contact with the heel, but instead makes contact along the entire foot directly to foot flat.

The bracing strategy for this mild-moderate level includes 1) correcting foot position as required, 2) blocking or strongly resisting plantarflexion and encouraging dorsiflexion to improve heel strike during gait and 3) maintaining ankle range. Brace ankle position should be set at 3 to 4 degrees dorsiflexion whenever possible. The plantarflexion resist offered by a DAFO 3.5 brace may be suitable, provided the accompanying dorsiflexion resist allows suitable mobility. The plantarflexion block offered by a DAFO 2 or DAFO 3 is suitable when free dorsiflexion is

required. Factors influencing choice will be level of muscle tone, ankle range, patient size and desired medial-lateral control. Maintenance of ankle range increases in importance, particularly as range diminishes.

### Moderate-to-Severe Toe Walking

In the moderate-to-severe form of toe walking, spastic contractures are chronic and relatively strong. Foot alignment may be affected by high tone pronation or supination. Ankle range may be limited, but can still be corrected close to 90°. When gait is initiated (no brace), the patient's foot is pulled into plantarflexion and makes floor contact with the forefoot only (toe walking).

As the level of high tone plantarflexion increases, seating the heel down into the brace will become more difficult. Pressure along the instep strap will be very high, often to the point of discomfort. The full plantarflexion block of DAFO 2 or DAFO 3 is required to counter strong plantarflexion contrac-

tures. Brace ankle position should be set at 3-4° dorsiflexion whenever possible. For the highest levels of tone, the maximum control qualities of the DAFO Turbo two-part brace may be required.

As contractures of the *gastrocnemius m.* and/or Achilles tendon increase in strength and degree, there is a higher likelihood that additional therapies will be necessary to get enough ankle range to make brace use feasible. These would include: 1) serial casting with Botox; 2) an active stretching program and night positioning brace; and 3) heel cord surgery.

If these are not available, additional bottom stabilization in the raised region (heel wedge) to support the patient's weight can be beneficial. This is only feasible up to about one inch of heel height, depending on the size of the patient, as the brace becomes difficult to fit in a shoe.

## Dynamic Couple Making a Difference

At the American Academy of Cerebral Palsy and Development Medicine Conference (AACPDMD) last fall, the team at the Cascade Dafo exhibit booth met Izabela and Richard Koscielny. Practicing physical therapists, the Koscielny's are publishers of Cerebral Palsy Magazine and owners of Therasuit LLC, a budding company developing innovative methods for physical therapy treatments based in Keego Harbor, Michigan.

Originally from Poland, this dynamic couple impressed Cascade with their energy and passion for pediatric physical therapy. They are active, accomplished, and work closely together to



Richard Koscielny with a Therasuit patient

make a difference in the field and in their patients' lives. They each hold a masters degree in physical therapy and are certified fitness trainers. They established their company Therasuit

in 2002. After that, in 2003 they launched the Cerebral Palsy magazine.

The Pediatric Fitness Center was established in 2003 to offer therapy for individuals with Cerebral Palsy. Izabela is a certified yoga instructor for special children, and Richard is a physical education trainer specializing in aquatic therapy. Training methods developed by the couple are offered to therapists for adoption into their respective practice.

Izabela and Richard were practicing physical therapists when their daughter Kaya was born with cerebral palsy, 14 years ago. As both professionals and

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## Bracing for Adults

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In addition to pediatric patients with CP or other neurological challenges who are now adults, practitioners often see adult patients with a variety of complaints including plantar fasciitis, stroke (CVA), poor stability from advanced age or heel ulcerations from extended bed rest.

When bracing for adults, we find the overall main challenge is to choose a style that is appropriate for the patient's size and weight. There is less room for error in identifying a style that is appropriate to the patient's presentation as underbracing can lead to premature breakdown or ineffectiveness of the device. Another concern is customizing the brace so that it fits well into the patient's shoe. Adult shoes tend to have less depth to them proportionally than children's shoes do, although this challenge is diminishing as more specialty products become available that address the issue of depth.

Adults with high tone can have any number of diagnoses such as CP or head injury that exhibit excessive plantar flexion, poor positioning of the foot and excessive hindfoot varus or valgus. The Turbo would be most beneficial to these patients. The outer shell of the Turbo should be specified to be made with ¼" polypropylene and if more stability is necessary, to add posterior reinforcement. The outer shell should also remain full length at the toe plate to give a knee extension moment in assisting with excessive plantar flexion. The inner boot should also be specified to be made out of a thicker plastic (1/8") and should have bead reinforcement to help prevent buckling of the instep. Heel stabilization should be eliminated

to reduce friction in donning. Anterior strap should always go through a D-ring and an additional strap could be considered for very large patients, or for those patients that will heavily bear weight on these straps. An additional anterior strap added distal to the first will help to distribute pressure. All straps should have plastic reinforcement washers and be attached with copper rivets. The instep strap should be reinforced with Dacron. These specifications should be listed in the "special instructions" box on the bottom right side of the order form.

Geriatric adults that have been prone to heel ulcerations because of extended bed rest would benefit from several brace designs. The braces that would work for this patient group would include the DAFO 8, DAFO 9, Softy 3, 3.5, and Turbo. Giving ample room to the ulcerated area will take pressure off the ulceration and allow it to heal. This can be achieved by adding volume to the foot directly over or around the lesion prior to cast by using foam or moleskin. Alternatively, writing a request for this modification in the special instructions box indicating the specific area on the back of the work order would also be appropriate. Identify the problem area with an indelible pencil or sharpie on the cast. Adding a walking sole on these orthoses will aid in transfers and eliminate the need for a shoe. This is only recommended for non ambulatory or very minimally ambulatory patients. Keep in mind that many of these patients may lack normal ROM, and your casting and instructions should reflect that.

Occasionally components of the DAFO 2 can be overstressed due to size and weight of the patient. Extra features are available to strengthen the brace

components. For cases where that may be a concern call Cascade Technical Support to discuss these options.

More straight forward solutions are available for adults with post CVA, hindfoot varus or valgus, and plantar fasciitis. Patients with CVA who exhibit classic symptoms of equinovarus or drop foot and supination fare well with the DAFO 3.5, the DAFO 4.5, and the DAFO Hemi. Hindfoot varus and valgus (as in the case of posterior tibialis tendonitis or rupture) without high tone would benefit from the DAFO 4. Adults with symptoms of plantar fasciitis would benefit from the DAFO 9, which is a custom stretching orthosis to be worn at night. This brace may be preferable to many off-the-shelf versions due to its lower profile.

In all cases of bracing adults, care must be taken to minimize bulk while maintaining the best possible support for the patient. This includes:

1. Trim lines. Alter dorsal trimlines so they are proximal to the metatarsal heads. The toe plate can be trimmed at the toe sulcus. Indicate this on the work order or trim at time of fitting.
2. Strapping. Eliminate the forefoot strap and have a "Y" strap installed instead.
3. Heel stabilizations. Eliminating this reduces friction during shoe donning/doffing, and reduces the overall bulk. Apply on patients with hind foot varus or valgus to control eversion/inversion if necessary.

Practitioners at Cascade P&O who see adults frequently, find it is important to explain thoroughly to adult patients what they are going to do when casting and bracing. Adults are generally interested in looking at a sample brace and having the functionality and benefits

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## Patient Case History- Kelly

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braces for a year. Her physician called me before writing a prescription to see if I would try serial casting without Botox, so that Kelly could get back into braces as quickly as possible. I tried one cast and had to remove it after two days because she couldn't tolerate it. So, we waited for the Botox.



Fig. 1

Functional goals included improving alignment of the foot and ankle to help reduce tone and to facilitate active movements for reduced support when sitting, to

improve standing and balancing, and to use in her gait trainer. Kelly had severely pronated feet with calcaneal valgus, forefoot abduction, and hallux valgus (Fig 1).

The right foot had considerably more deformity than the left. She appeared to have good dorsiflexion range of motion (ROM) bilaterally, but the right heel cord was tight and all dorsiflexion was occurring through midfoot pronation. Her calcaneus was plantarflexed and forefoot dorsiflexed, resulting in a rocker bottom deformity.

Kelly had Botox to the right *peroneal m.*, *gastrocnemius m.*, and *hamstrings mm.* followed by serial casting to improve her foot and ankle alignment. She wore a knee immobilizer at night to stretch the *gastrocnemius m.* and *hamstring mm.*

While the serial casting produced some improvement, Kelly still had significant pronation with forefoot abduction (Fig 2).

Posterior views of first and final serial casts dramatize this improvement (Fig. 3). Because of her deformity, no footplates fit her feet. She was

molded for her DAFOs non weight bearing so all arches could be accentuated by hand. Her hindfoot valgus was reduced by supinating and adducting the forefoot with one hand and applying a corrective force in the ST area of the calcaneus with the thumb of the other hand.



Fig. 3

DAFOs. I requested heel wedging to simulate 3-4 degrees of dorsiflexion which would be required for full heel contact when standing. On the order form, I requested no build-ups over the medial malleolus and navicular; instead, additional foam was added over these areas to provide maximum control without pressure problems. Toe abduction loops were requested to control hallux valgus and to help control her forefoot abduction. I requested strong Type 2 ST support and ¼ inch medial forefoot (varus) posting to help control the calcaneal valgus.

DAFO Turbos were chosen because the two-piece design makes donning the orthoses easier and a strong outer shell provides maximum control even for a very high tone foot. The inner SMO of the Turbo can also be worn alone when



Fig. 2

Kelly had dorsiflexion range just to 90 degrees when her subtalar joint was in neutral, so this would be her ankle position in her

using a gait trainer. I usually request that bottom stabilization be added to the inner shell when it will be worn alone. Kelly began her adjustment period with several wearing periods each day and short breaks to check for excessive pressure. She had redness over her right medial malleolus once she reached four hours wearing time, so I heated and relieved slightly over this area and added a layer of 3/16 inch foam over the ST padding and in the medial longitudinal arch. I also added a layer of 1/8 inch foam over the lateral border of the fifth metatarsal and toe to better control forefoot abduction and hindfoot valgus. Inhibition of tone appears to take place when her feet are properly aligned (though this outcome has not been proven in a controlled study). The DAFOs are holding Kelly's feet in good alignment (Fig 4) and her feet are tolerating the braces well.



Fig. 4



**Cidny Fox**  
CPO, FAAOP

*Cidny Fox graduated from the University of Washington in 1982 with a BS in Prosthetics and Orthotics. She is certified through The American Board for Certification in Orthotics and Prosthetics, and is a Fellow of AAOP. Cidny has specialized in pediatric orthotics since 1986, and works at Orthotic Solutions LLC, in Fairfax, Virginia.*

## Dynamic Bracing Workshop Schedule

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March 10 & 11  
Lafayette, LA

March 10 & 11  
Fort Smith, AR

March 10  
Fort Smith, AR

March 25 & 26  
Ferndale, WA

March 30 & 31  
Hutchinson, KS

March 31 & April 1  
Charlotte, NC

April 6 & 7, 2006  
Fort Campbell, KY

April 28  
Albuquerque, NM

April 29  
Albuquerque, NM

May 19 & 20  
Littleton, CO

September 15 & 16  
Decatur, GA

September 28 & 29  
Conway, AR

*If you would like information on sponsoring a workshop, please contact Karen Chritenson at 1.800.848.7332.*

## Bracing for Adults

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of the brace explained in advance. Although these patients are referred by a physician we find it is valuable to ask the patient if they understand what is going on with them and why their doctor has suggested they see a practitioner for a bracing solution.

If you have adults in your practice, or your pediatric patients are growing larger and you would like to discuss DAFO options, please call the Technical Support department and they will be happy to discuss with you the different products available to your patient.

## Dynamic Couple Making a Difference

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committed parents, they explored different therapeutic methods during Kaya's early years. They tried many techniques including: Vojita Method, Bobath, DomanDelcato, PNF, Conductive Education and aquatic therapy.

Through their research, they learned about technology first designed to help astronauts counteract the muscle atrophies and osteoporosis caused by weightlessness experienced during long trips in space. Izabela and Richard have since designed and patented Therasuit™, to help rehabilitate neurological and sensory disorders. The Therasuit product uses a series of elastic bands to help align a patient's body. While the patient is wearing the bands, Izabela and Richard work with the patient through a variety of physical therapy exercises to help normalize muscle tone and increase active range of motion, among other things.

Exhibiting at the different industry shows allows Cascade to meet many individuals and learn about their specific practice. Meeting Izabela and Richard was indeed a privilege and Cascade is happy to promote Cerebral Palsy Magazine and find it a valuable source for professionals and families. Cascade DAFO is always interested in hearing about individuals' practices and experiences. Please stop by and say hello at the next show. A listing of events we will be attending is shown below.

## Upcoming Trade Shows

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AAOP  
Regional Meeting  
April 21-23  
Seattle, WA

ACPOC  
May 17-20  
Sacramento, CA

AACPDM  
Sept 13-16  
Boston, MA

AOPA  
Sept 27-30  
Hollywood, FL

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