A New Dynamic Foot Abduction Orthosis for Clubfoot Treatment

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Abstract: Recurrent clubfoot deformity after successful initial correction with the use of the Ponseti method continues to be a common problem and is often caused by noncompliance with wear of the traditional foot abduction brace. The purpose of this study was to assess the results of a newly designed dynamic foot abduction orthosis in terms of (1) parental compliance and (2) effectiveness in preventing recurrent clubfoot deformities. Twenty-eight patients (49 clubfeet) who were treated with a dynamic foot abduction orthosis in accordance with the Ponseti method were included in this study. Of the 28 patients, 18 had idiopathic clubfeet (31 clubfeet), 2 had complex idiopathic clubfeet (4 clubfeet), 5 had myelodysplasia (8 clubfeet), and 3 were syndromic (6 clubfeet). The mean duration of follow-up was 29 months (range, 24–36 months). Noncompliance was reported in only 2 (7.1%) of the 28 patients in the new orthosis compared with the authors' previously reported 41% (21/51) noncompliance rate in patients treated with the use of the traditional foot abduction brace. The two patients in this study, in which parents were noncompliant with orthosis wear, developed recurrent deformities. There were 2 patients (7%) who experienced skin blistering in the new orthosis compared with 12 (23.5%) of 51 patients who experienced blistering with the use of traditional abduction brace in the authors' previously reported study. Logistic regression modeling compliance and recurrence revealed that noncompliance with the foot abduction orthosis was most predictive of recurrence of deformity (odds ratio, 27; 95% confidence interval, 2.2–326; $P = 0.01$). The articulating foot abduction orthosis is well tolerated by patients and parents and results in a higher compliance rate and a lower complication rate than what were observed with the traditional foot abduction orthosis.

Key Words: clubfoot, complications, foot abduction orthosis, Ponseti method

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The Ponseti method for the treatment of clubfoot deformity has become increasingly popular, with many centers now applying this method successfully in the initial management of clubfoot.[1–4] The Ponseti method involves serial manipulation, a specific technique of cast application, a percutaneous Achilles tenotomy, followed by the use of a foot abduction brace.[5] This brace has been traditionally consisted of open-toed, high-top, straight-last shoes attached in external rotation to a Denis Browne bar that has a length approximating the distance between the child's shoulders. The brace is worn full time (23 hours a day) for 3 months and then at night and nap time (duration, 14–16 hours a day) for 3 to 4 years. However, parental noncompliance with the use of the foot abduction brace is a commonly reported problem by investigators using the Ponseti method.[1,3,6] Noncompliance leads to recurrent clubfoot deformities that may require extensive surgery to correct.[1] Noncompliance has been associated with skin blistering from the leather shoes and with parental concerns about the restrictiveness of leg motion in the brace.[1]

The author (M.B.D.) has designed a new dynamic foot abduction orthosis for the purpose of improving parental compliance and, therefore, decreasing the number of recurrent clubfoot deformities. This new brace has several features that distinguish it from the traditionally used foot abduction brace. First, the new brace is designed to allow active movement (flexion and extension of the legs) in a single plane and is therefore considered a dynamic brace. The dynamic nature of this orthosis may preserve muscle strength and be less restricting to the child. Second, the new brace consists of a soft, custom-molded interface that is placed inside a solid ankle-foot orthosis (AFO) that is then attached to the articulating bar. The custom fit of this interface to the individual foot is designed to minimize skin blistering. The foot is secured into the orthosis by the use of Velcro straps rather than laces and buckles. Finally, the bar is designed with a release mechanism in the middle, which allows the parents to easily detach and reattach the bar when placing their child in a high chair or car seat without having to take the child's feet out of the brace.

The purposes of this study were (1) to evaluate the effectiveness of this dynamic orthosis in preventing clubfoot relapse after successful initial correction using the Ponseti method, (2) to determine the rate of noncompliance with the orthosis, and (3) to assess complication rates when compared with the author's previously reported experience with the traditional brace.[1] Improved compliance with brace wear should lead to a lower incidence rate of recurrent clubfoot deformities and, therefore, improved outcomes.

METHODS

The cases of 28 patients (49 clubfeet) treated with the newly designed dynamic orthosis after clubfoot correction

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using the Ponseti method[1,7] were retrospectively reviewed. This represents the first 28 patients who have used the articulating foot abduction orthosis. Eighteen of the 28 patients were initially prescribed the traditional foot abduction brace and were later prescribed the dynamic abduction orthosis because of skin blistering and/or parental noncompliance with the traditional brace. The remaining 10 patients were placed initially into the dynamic foot abduction orthosis after correction with the Ponseti method.

Fourteen (50%) of the 28 patients had failed treatment elsewhere before referral. This included 10 patients who had undergone previous casting, 4 patients who had casting and a percutaneous tenotomy of the Achilles tendon, 1 patient who had a posterior tibialis lengthening, and 1 who had undergone both an Achilles tendon tenotomy and a posterior tibialis tendon fractional lengthening at an outside institution. The deformity in all 14 patients was fully corrected by M.B.D. upon referral with the use of the Ponseti method. Seven (50%) of the 14 patients were placed initially into the traditional brace, whereas the remaining 7 patients were treated primarily with the use of the new dynamic foot abduction orthosis.

The pretreatment classification was assigned using the scoring system by Dimeglio et al.[8] The feet were classified into 4 categories with respect to the severity of the deformity. Grade I feet have a mild deformity that is more than 90% reducible (score, 0–5 points). Grade II feet have a moderate deformity (score, 5–10 points). Grade III, the most common category, indicates a severe deformity (score, 10–15 points). Grade IV feet have a very severe deformity (score, 15–20 points) and an arthrogrypotic appearance.

In addition to the medical history of the patient and his or her family, the following data were collected: occurrence of previous casting or surgical intervention, the age when casting was begun, the number of casts required for correction, the need for a percutaneous Achilles tenotomy to obtain correction of the equinus deformity, previous use of the traditional foot abduction brace, and occurrence of associated brace complications, such as skin breakdown. All clubfeet in this study were fully corrected before bracing was initiated. After correction was obtained, passive ankle dorsiflexion and plantar flexion were measured by 2 separate examiners using a handheld goniometer. Each examiner performed the measurements on 2 separate occasions that were spaced 1 month apart. Any recurrent deformities were documented with regard to the age at the time of recurrence, the severity of the recurrent deformity (according to the Dimeglio grading system), and any additional treatment necessary to regain correction. Parental report of noncompliance with brace use was used as a measure of compliance. Noncompliance was defined as not wearing the brace for the number of hours prescribed.

Treatment Regimen

All patients were treated at our institution with the use of the Ponseti method according to published protocol.[1] If less than 10 degrees of ankle dorsiflexion was present, a percutaneous tenotomy of the Achilles tendon was performed to address persistent ankle equinus. Brace measurement, either for the traditional brace or for the new dynamic foot abduction orthosis, was performed at the time of tenotomy or, if no tenotomy was performed, before the last cast. The braces were prescribed to be worn full time (approximately 23 hours per day) for 3 months, followed by part-time use (at nighttime and nap time, approximately 14 to 16 hours a day) until the age of 4 years. Those patients who were treated initially with the use of traditional brace were prescribed a standard Denis Browne bar with attached open-toed, high-top, straight-last shoes at shoulder width apart. Each affected foot was placed in 70 degrees of external rotation, and each normal foot was placed in 30 degrees of external rotation. A description of the new dynamic orthosis is to follow.

It is important that the parents gain comfort putting the brace on their child in the clinic so that they will not be as intimidated once they are faced with this at home. A dedicated clubfoot nurse in our clinic discusses teaching with the parents and also makes follow-up phone calls to the parents during the first week of brace wear to ascertain whether there are concerns that need to be addressed as was done for all patients in this study. This has greatly increased parental compliance with brace wear in our patient population.[1]

To help prevent a recurrent equinus contracture, the parents were instructed and given a handout on how to effectively perform range-of-motion exercises for the ankle when it is out of the brace. The exercises are performed with the patient supine. The parent uses one hand to stabilize the leg with the knee bent. The other hand is used to grasp the heel and then place the ankle in maximum dorsiflexion followed by plantar flexion. The parents repeat this exercise 40 times at a setting. These exercises are performed at every diaper change and have improved our ability to maintain ankle motion achieved at the time of tenotomy.[1]

Most relapses occur in the hind foot and are clinically evident by the development of equinus and varus deformity of the heel. The original correction may be recovered in 4 to 8 weeks with manipulations and long leg plaster casts that are changed weekly and hold the foot in marked external rotation and as much dorsiflexion as possible at the ankle. This treatment is followed by a repeat Achilles tendon lengthening when the dorsiflexion of the ankle is less than 15 degrees. The tendon lengthening involves a complete release of the tendon and is performed in a percutaneous fashion in patients who are up to 24 months of age; thereafter, tendon lengthening is performed through an open approach and is usually accompanied by a posterior release of the ankle and subtalar joint.

Dynamic Foot Abduction Orthosis

The dynamic foot abduction orthosis (Orthotics and Prosthetics, St Louis, Mo) is fashioned to permit independent leg movement (Fig. 1). Solid ankle foot orthoses (AFO's) made of one-eighth-inch plastic copolymer are attached to an aluminum bar and are custom molded from each patient's foot. The AFOs are lined with a soft, flexible custom-molded interface made of Duraflex, which is designed to minimize

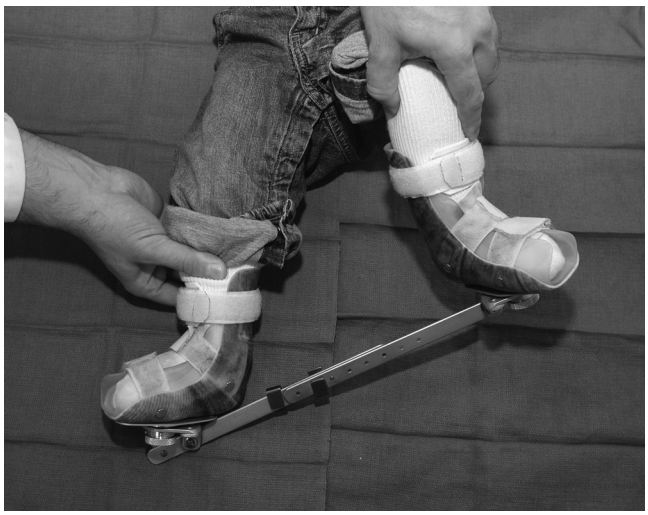

FIGURE 1. A 3-month-old boy in the dynamic foot abduction orthosis illustrating the ability to flex and extend the knees while using the orthosis.

skin complications (Fig. 2). This custom-fit interface is made using a cast mold of the foot and is created immediately before the tenotomy of the Achilles tendon. The feet are secured in the orthosis using Velcro straps, which are quicker and easier to secure than laces and buckles. The middle strap is the most crucial strap for securing the foot and is the strap that should be tightened first. The straps originate on the inside of the AFO to provide a more secure fit. A soft tongue insert is used to prevent skin irritation on the dorsum of the foot. The AFOs are positioned 1 inch wider than shoulder width on the bar. Each clubfoot is placed in 70 degrees of external rotation; if unilateral, the normal foot is placed in 30 degrees of external rotation. The ankle is placed in neutral

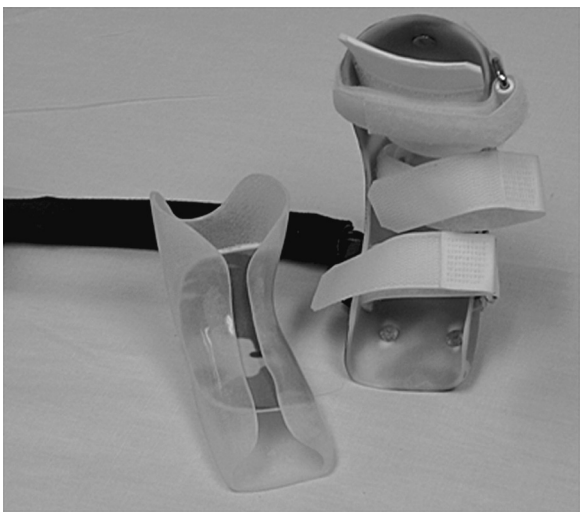

FIGURE 2. A photograph of the AFO and custom-made Duraflex insert portions of the dynamic brace. The tongue, which is used to prevent skin irritation on the dorsum of the foot, is also shown.

FIGURE 3. Illustration of the plantar flexion block on the bar designed to prevent the ankle from going into equinus while in the brace.

dorsiflexion. The ends of the bar feature an articulating hinge that allows 100 degrees of articulation for each foot in the coronal plane. A plantar flexion stop is optional on the bar if the physician wants to limit the amount of mobility in the brace (Fig. 3). In addition, the bar has a quick-release mechanism in the middle to allow for adjustment in length and to provide the parents a way of quickly getting their child out of a car seat or high chair without having to remove the entire brace (Fig. 4). The AFOs and Duraflex interface are remeasured after the first 3 months and then individually thereafter to account for each infant's growing foot. The average weight of the dynamic foot abduction orthosis system is 13.8 oz compared with 15.4 oz of the traditional brace.

Statistical Analysis

Continuous data are expressed as mean and SDs. All patient characteristics and demographic data on the families were analyzed with the use of logistic regression analysis

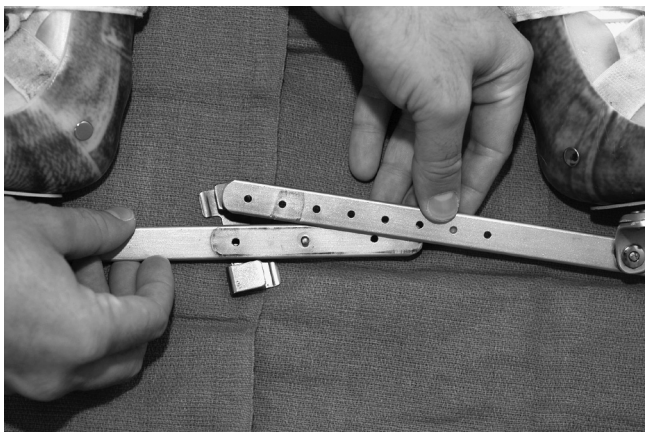

FIGURE 4. Illustration of the quick-release mechanism in the middle of the bar, which allows for adjustment in bar length and providing the parents a way to get their child out of a car seat or high chair without having to remove the entire brace.

modeling recurrence and compliance. When the overall P value was significant ($P \leq 0.05$), the logistic regression odds ratio and the associated 95% confidence interval (CI) were obtained. Unpaired t tests were used to compare the data in our cohort with those in another cohort reported in the literature.[1] A P value less than 0.05 was considered significant. Intraclass correlation coefficients (ICCs) were used to evaluate the interrater and intrarater reliability for dorsiflexion and plantar flexion measurements, respectively. In this study, ICC values of 0.80 or greater indicate excellent reliability. The 95% CI was also calculated for each ICC. The data analysis was generated using SAS version 9.1.3 software of the SAS System for Linux (SAS Institute Inc, Cary, NC).

RESULTS

Of the 28 patients, 18 had idiopathic clubfeet (31 clubfeet), 2 had complex idiopathic clubfeet[9] (4 clubfeet), 5 had myelodysplasia (8 clubfeet), and 3 were syndromic

TABLE 1. Clinical Data on the 28 Patients

Case	Other Diagnosis	Dimeglio Grade (Pretreatment)	Previous Treatment	No. Casts to Obtain Correction	Tenotomy of Achilles Tendon	Compliance With Traditional Orthosis	Compliance With Dynamic Orthosis	Skin Blistering With Traditional Orthosis	Skin Blistering With Dynamic Orthosis
1		III	Casting	4	Yes	No	Yes	Yes	No
2		II		3	Yes	No	Yes		No
3	Complex idiopathic clubfoot[9]	IV	Casting	7	Yes	No		Yes	No
4		II	Casting	4	Yes	NA	Yes	NA	No
5	Myelodysplasia	IV		5	Yes	No	Yes	Yes	No
6		III	Casting, Achilles tendon tenotomy	3	No	No	Yes		No
7		III	Casting	4	Yes	NA	Yes	NA	No
8	Trisomy 10	IV		5	Yes	No	Yes	Yes	No
9		II		4	Yes	No	Yes	NA	No
10		III	Casting	3	Yes	NA	No	Yes	No
11	Myelodysplasia	III		5	Yes	No	Yes	NA	No
12		III	Casting, Achilles tendon tenotomy	3	Yes	NA	Yes	NA	No
13	Freeman-Sheldon syndrome	III		5	Yes	NA	Yes	NA	No
14		II	Casting	4	Yes	NA	Yes	NA	No
15		III	Casting, posterior tibialis tendon lengthening	3	Yes	NA	Yes		No
16	Myelodysplasia	III		5	Yes	No	Yes	Yes	No
17		III	Casting	4	Yes	No	Yes	NA	No
18	Larsen syndrome	IV		5	Yes	No	Yes	Yes	No
19		III	Casting, Achilles tendon tenotomy	3	Yes	NA	Yes	NA	
20	Myelodysplasia	III		4	Yes	No	Yes	NA	No
21		III		3	No	NA	Yes	NA	No
22		II	Casting, Achilles tendon tenotomy	3	Yes	No	Yes		No
23	Complex idiopathic clubfoot[9]	IV	Casting	11	Yes	No	Yes	Yes	No
24		III	Casting	4	Yes	NA	No	NA	Yes
25		II	Casting, Achilles tendon tenotomy, posterior tibialis tendon lengthening	3	Yes				
26	Myelodysplasia	III		5	Yes	No	Yes	NA	No
27		III		4	Yes	No	Yes	Yes	No
28		III	Casting	3	Yes	NA	Yes	NA	No

NA indicates nonapplicability of data.

TABLE 2. Intrarater and Interrater Reliability Analysis of Dorsiflexion and Plantar Flexion

	No. Observations	ICC	95% CI	
			Lower Bound	Upper Bound
Intrarater reliability (rates were compared between 1st and 2nd time within a rater)				
Dorsiflexion				
Overall ICC (combined the rating of rater 1 and rater 2 for each time)	112	0.96	0.93	0.98
Plantar flexion				
Overall ICC (combined the rating of raters 1 and 2 for each time)	112	0.87	0.79	0.92
Interrater reliability (rates were compared between raters 1 and 2)				
Dorsiflexion				
ICC for 1st rating	56	0.96	0.92	0.98
Plantar flexion				
ICC for 1st rating	56	0.97	0.94	0.99

(6 clubfeet). Twenty-six patients were white (92.9%), 1 was African American (3.6%), and 1 was Indian (3.6%). The pretreatment classification was Dimeglio grade II (moderate) in 6, grade III (severe) in 33, and grade IV (very severe) in 10 feet. Family history was positive for clubfoot in 5 patients (17.9%). Twenty-one patients (75%) had bilateral clubfeet, whereas 7 (25%) had unilateral clubfeet (Table 1).

Casting was initiated at our institution at a mean age of 16.1 weeks (range, 1.0–77.1 weeks). The mean number of casts needed for correction was 4.2 (range, 3–11 casts). Forty-six (94%) of the 49 clubfeet underwent a percutaneous Achilles tendon tenotomy at our institution to correct a residual equinus contracture. Only 2 patients (3 clubfeet) did not require an Achilles tendon tenotomy at our institution, one of which had an Achilles tenotomy before presentation to us. All patients achieved full correction of deformity before bracing. The mean duration of follow-up was 29 months (range, 24–36 months). The mean ankle dorsiflexion was 18 degrees (SD, ±4 degrees; range, 10–28 degrees), and the mean plantar flexion was 28 degrees (SD, ±7 degrees; range, 18–38 degrees). The interrater and intrarater reliability for ankle range-of-motion measurements was high and is reported in Table 2.

Eighteen patients who were not wearing the traditional brace as prescribed were subsequently treated with the use of the new dynamic orthosis. The remaining 10 patients were treated with using only the new orthosis. One reason given for noncompliance with the traditional brace was the occurrence of skin breakdown and/or blistering of the heels and dorsum of the foot (9 patients [50%]). A second reason given for noncompliance with the traditional brace was the difficulty taking the brace on and off (9 patients [50%]). Recurrent deformity occurred in 12 (67%) of the 18 patients who were prescribed the traditional brace, when there was hind foot varus of 5 degrees or greater and/or ankle dorsiflexion of less than 15 degrees. Seven (77.8%) of the 9 patients who had skin complications developed recurrent deformities because of the length of time of not using the brace, which was required for blister healing. All recurrent deformities have been managed with repeat casting (12 patients), repeat Achilles tendon tenotomy (2 patients), and maintenance of correction in the dynamic foot abduction orthosis (12 patients).

Noncompliance with the use of the new orthosis was reported in 2 (7.1%) of the 28 patients. One (3.6%) of these patients experienced skin breakdown related to improper application of the orthosis. This led to recurrent deformities that required repeat casting. After successful casting, the corrections have been maintained to date with proper application of the new orthosis. The remaining patient was not kept in the orthosis because of the work schedule of the primary caregiver and the lack of additional family support. This patient has had no further surgery, and the correction is being maintained to date with periodic long leg casting, approximately every 3 months for 1 week at each casting interval. The patients in this study treated with the use of the new dynamic foot abduction orthosis had improved compliance and lower complication rates than did a published cohort of patients with clubfoot treated with the use of the traditional foot abduction brace[1] (Table 3).

Logistic regression modeling compliance and recurrence revealed that noncompliance with the bracing regimen was most predictive of recurrence of deformity (odds ratio,

TABLE 3. Comparison of Patients Treated With the New Dynamic Foot Abduction Orthosis in Current Study Compared With Patients Treated With the Traditional Foot Abduction Orthosis in Previous Study by Dobbs et al[1]

	Study by Dobbs et al[1] (51 Patients)	Current Study (28 Patients)	*P*
Noncompliance with use of foot abduction orthosis	21 Patients (41%) (traditional foot abduction orthosis)	2 Patients (7.1%) (dynamic foot abduction orthosis)	<0.005
Recurrent clubfoot deformity	16 Patients (31%)	1 Patient (3.6%)	<0.001
Skin blistering in foot abduction orthosis	11 Patients (22%) (traditional foot abduction orthosis	1 Patient (3.6%) (dynamic foot abduction orthosis)	<0.004

TABLE 4. Cost of Articulating Versus Traditional Orthosis (in US $)

	Articulating Orthosis	Traditional Orthosis
Initial brace cost		
Shoes	1000 (AFOs)	100 (Markell)
Bar	200 (articulating)	82 (solid)
Total cost	1200	182
Cost of bracing for 2 years		
Shoes	1000 × 4 pairs = 4000	100 × 8 pairs = 800
Bar	200	82 × 4 = 328
Total cost	4200	1128

27; 95% CI, 2.2–326; $P = 0.01$). Risk of recurrence was not associated with age at initial treatment, severity of clubfoot, or previous casting or surgery.

The initial cost of the articulating foot abduction orthosis is US $1200 compared with US $182 for the traditional brace. Table 4 includes not only the initial cost of each bracing system but also the average cost of bracing during the first 2 years of treatment for a patient. The average insurance reimbursement for the articulating foot abduction orthosis is US $1000 per brace per patient, leaving an average of US $200 out-of-pocket pay. For the traditional brace, the average insurance reimbursement is US $100 per brace per patient, leaving an average of US $82 out-of-pocket pay.

DISCUSSION

The newly designed articulating foot abduction orthosis is equally effective or more so than the traditional brace, considering that the rates of clubfoot relapse were less in the new orthosis than in those reported in several series using the traditional brace.[1,3,6] The most critical factor leading to clubfoot relapse after successful initial correction with the use of the Ponseti method has been shown to be noncompliance with brace wear.[1,3,6] The effectiveness of the new orthosis is likely related to the high parental compliance rate. Previous studies have reported 30% to 40% noncompliance rates in the use of the traditional brace.[1,6] In the current study with the new brace, the rate was considerably less at 7.1%.

One reason for parental noncompliance in the use of traditional bracing is the reported difficulty in taking the brace on and off. The new articulating abduction orthosis has several features to improve the ease of use. First, the feet are secured in the AFOs with the use of Velcro straps rather than laces and buckles that are used in the traditional brace. The Velcro straps are much quicker to secure and loosen. Another feature of the new orthosis is a release mechanism in the middle of the bar that provides the parents a quick way to get their child in and out of a high chair or car seat without having to take the entire brace off and put it on again.

Another reason for parental noncompliance in the use of traditional bracing is irritability of the infant while using the brace. The brace is often removed to placate the patient. If the parents frequently remove the brace when the child cries, it becomes more and more difficult to use the brace as prescribed. The new articulating abduction orthosis allows for independent leg movement, which seems to be better tolerated by the patient. If the child is tolerating the brace, there is a higher likelihood of parental compliance.

Skin ulceration and blistering in the traditional brace are common problems and can also lead to noncompliance.[1] Blister formation in the traditional brace is likely caused by 2 factors. The leather straight-last shoes used in the traditional brace often do not fit well onto an infant's foot. This is especially true in premature infants and in those patients with complex idiopathic clubfeet.[9] Shoes that are too big, which is often the case in premature infants, allow the child's foot to rub up and down in the shoe, which can result in heel ulceration. Shoes that are not wide enough, which is often the case in complex idiopathic clubfeet, can also cause skin irritation. The tongue of the shoe has also been reported to cause blisters on the dorsum of the feet.[1] The new articulating abduction orthosis has a custom-molded Duraflex insert that is made to fit each child's foot and a soft tongue insert to protect the dorsum of the foot. This form fit has resulted in less slipping and, therefore, less skin blisters. This form fit is particularly important in patients with decreased peripheral sensibility, such as those with myelodysplasia. Insensate infants are unable to express their discomfort once skin breakdown begins. Two of the 5 patients with myelodysplasia in the current study developed severe blisters with the use of the traditional brace, which resulted in a prolonged time without cast manipulation or orthotic use to allow healing. Only 1 of the 28 patients in the current study developed skin blistering with the use of the new orthosis.

The articulating bar also likely decreases skin blistering because the independent leg movement makes it harder for the patient to pull the feet out of the orthosis. The solid bar seen in the traditional brace provides a lever for the child to use in pulling the feet out of the shoes. As the child tries to pull the feet out of the brace, a blister often develops on the back of the heel from rubbing in the shoe. With the articulating bar, as the child tries to pull one foot up, the other foot goes down, providing less of a lever and subsequently less friction to the back of the heel. Our study revealed a low incidence of skin complications and noncompliance with the articulating foot abduction brace. These early results are encouraging and may not reflect the true efficacy of the articulating brace for several reasons. We have reported on cases of a complex clubfoot patient population, including those with myelodysplasia, a variety of syndromes, complex idiopathic clubfeet and those patients with idiopathic clubfeet. We have also included a large percentage of patients who had previously failed treatment elsewhere. Ten of the patients had undergone manipulative casting, and 6 of them had undergone limited surgical treatment before referral. Finally, we have introduced bias by selecting patients who had previously failed traditional bracing secondary to parental noncompliance. These parents would be more likely to be noncompliant in the use of the dynamic orthosis.

Cost is an important consideration in the implementation of any new technology. The initial cost of the articulating

brace is higher than that of the traditional brace. However, this difference in cost does not account for the additional expense required to manage the recurrence of deformity rendered by the traditional brace. The 40% noncompliance rate of the traditional brace leads to a substantial number of treatment failures requiring repeat casting, tenotomies, and, in some cases, posteromedial releases.[1] In our practice, the articulating brace has demonstrated cost savings over the long term despite its higher initial cost.

Successful management of the patient with clubfoot requires a team approach with skilled pediatric orthopaedists, nurse educators, and orthotists. Although good success has been met in obtaining correction in clubfeet, maintaining correction has been more challenging.[1] Highly motivated parents may improve compliance, but no level of motivation can compensate for an imperfect brace. At short-term follow-up, a new orthotic system demonstrated excellent compliance and a low incidence of skin complications. Because recurrence of deformity can occur up to several years after correction, longer follow-up will be necessary to assess the efficacy of this orthotic system. Although our experience with the dynamic brace has been favorable, a randomized study comparing the dynamic orthosis with the traditional brace would provide an accurate assessment of outcome.

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