

Improved Outcomes Using a New Free Motion KAFO for Treatment of Blounts Disease vs. Traditional Locked Knee Designs

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Introduction

Non-surgical treatment of Blounts disease has been somewhat controversial. Compliance has been a primary issue in the locked knee designs due to the altered gait pattern and overall perception of being impractical. Past studies have shown some degree of success with use of a drop lock or solid upright KAFO variations¹. A more recent study has shown a high rate of spontaneous correction when varying stages of severity-specific Blounts disease is present².

Other risk factors related to failure include obesity, varus thrust and orthotic application at an age older than three³. To maximize results when managing bowing deformities of the lower limb, it is paramount to establish proper diagnosis, age appropriateness and progression of deformity. Differential diagnosis is multi-factor based and primary in determining likelihood of deformity progression and orthotic outcome. The factors include Familial⁴ obesity⁵, ethnicity, varus thrust, radiographic measures, stage of deformity⁶ and unilateral vs. bilateral involvement⁷.

Knee Ankle Foot Orthosis (KAFO) designs specific to Blount's disease and other bowing deformities of the knee have consisted of: solid single or double upright, single or double upright with drop lock hinge, and single upright with posterior swivel hinge and Positive Track Telescoping ankle joint. The length of time an orthosis is worn in a 24 hour period is determined by the prescribing physician. Individual preference ranges from 23 hour wear to just daytime or nighttime wear. Recently information was published regarding an equal split of those wearing at night only and a group during the daytime only, resulting in a 90% success rate⁸.

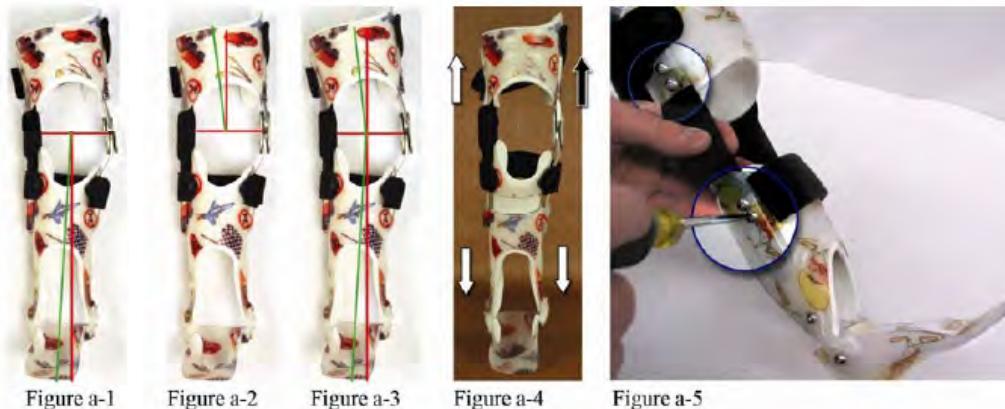
Method

In two case studies A and B – Patient A was an obese male. He originally was fit with a traditional Double Solid Upright KAFO (DSUK) design then transitioned to a new design. This new design, the V-Vas™ (Varum Valgum Adjustable Stress joint system Blounts KAFO (VVASBK) was chosen due to lack of compliance and associated deformity progression after being treated with the DSUK for 17 months. The second case study–B–was fitted with the custom VVASBK for orthotic management from the beginning of treatment. Initially the orthotist recommended traditional SSUK design because of previous success and familiarity with it. In doing so, the Pediatric Orthopedist intervened preferring not to use the DSUK design due to a concern for the patient being non-compliant. The orthotist and pediatric orthopedist decided to proceed with the new hinged double upright free motion knee VVASBK. The decision to use the VVASBK vs. any other design was because

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- 1 Raney et al., 1998; Richards et al., 1998; Zions & Shean, 1998; Supan & Mazur, 1985
 - 2 Shinohara et al., 2002.
 - 3 Raney et al., 1998
 - 4 Bathfield & Beighton, 1978; Evensen & Steffensen, 1957; Sevastikoglou & Eriksson, 1967; Sibert & Bray, 1977
 - 5 Dietz et al., 1982
 - 6 Blount, 1937; Johnston, 1990; Langenskiöld & Riska, 1964
 - 7 Loder & Johnston, 1987; Raney, et al, 1978; Richards et al, 1998; Schoenecker et al, 1985; Zions & Shean, 1998
 - 8 Marshall; O & P Business News. 2010

of the joint design and other associated benefits including, ease in adjustability and posterior opening cuff designs, to name a few.

The specific design features of the VVASBK (figures a - 1-5) include 1/8" polypropylene posterior opening thigh and tibial cuffs to simplify donning and doffing process. Closed cell foam lining encompassing the inside of the thigh and tibial cuffs that can be removed to accommodate circumferential growth. Accommodation of growth is achieved by adjusting the length of the medial and laterally femoral and tibial uprights in $\frac{1}{4}$ " increments (figure a-4). Tamarack® ankle joints, both medial and laterally allow relative dorsiflexion and plantarflexion while providing adequate M-L stability of the ankle. The medial and lateral ankle joint assures that the corrective forces are maximized proximally - it has been observed in the clinical setting that the use of only one medial or lateral ankle joint reduces the effectiveness of the proximal corrective forces. The ability to provide the corrective forces leading to the resolution of the skeletal malalignment is achieved through the unique design of the V-Vas™ Joint system. Success is attained through the joints ability to isolate measured tibial (figure a-1), femoral (figure a-2) and or tibio-femoral alignment (figure a-3) in 2° and 4° increments respectively, either independent or dependent of each other (figure a-5) as viewed in the coronal plane. It is believed that the resulting effect of the V-Vas™ Joint Systems dynamic adjustability capabilities actually provides a bending moment. This bending moment is what maintains the four point correction not only in full extension as do all the previous designs, but through out the full range of knee motion that is unique to the V-Vas™ Joint System. The unique mechanisms inherent to the overall design lies at the heart of the VVASBK's ability to exert the controlled corrective forces necessary to achieve the following positive outcomes and provide a natural environment for the developing child.



Results

Patient A is an obese male. The initial x-ray confirmed the diagnosis of Blounts disease with varus thrust. He was referred to the local Orthotist for measurement and eventual fitting. Orthotic treatment was initiated at the age of 2 and continued through the age of 5 + 4. At the age of 2 + 5, follow up radiograph (figure b-1) was obtained and the DSUK was discontinued due to compliance issues and consideration of the potential likelihood of spontaneous correction or surgical treatment.

Ten month follow up radiograph (figure b-2) revealed progression of the deformity and DSUK's were re-fitted to offset recurring progression of the deformity. Six months later radiographs confirmed an improvement of the deformity (figure b-3). At the age of 3 + 4 years or nine months after the previous visit, new radiographs were obtained (figure b-4) revealing recurring of the deformity due to non compliance specific to not wearing the DSUK's. During the same visit, the Doctor consulted with the Orthotist and a decision was made to proceed with the VVASBK. Cast impressions and associated measurements were taken for the VVASBK and sent for custom fabrication.



Figure b-1



Figure b-2



Figure b-3

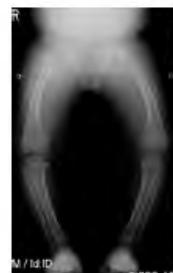


Figure b-4



Figure b-5



Figure b-6

Anatomical Concepts Inc. USA, is the fabricator and distributor for the V-Vas™ Joint System Blounts KAFO.

At the age of 4 + 4, six months post fitting of VVASBK, the radiograph (figure b-5) obtained showed significant improvement in comparison to previous orthotic management with the DSUK. Follow up at 5 +1 years of age again showed continued improvement in achieving more normal age-appropriate skeletal alignment (figure b-6).

Patient B is a non obese Caucasian male whose initial x-ray confirmed the diagnosis of Blounts disease stage 2 with varus thrust. He was referred to the local Orthotist for measurement and fabrication. At 1 + 11 years of age, radiographic evidence of deformity progressing was confirmed (figure c-1). Patient was fitted with VVASBK and seen for follow up four months post fitting at the age of 2 + 3, when radiograph was obtained showing (figure c-2) improvement in skeletal alignment. The radiograph completed at ten months from initial fitting showed a continual overall improvement in the skeletal alignment (figure c-3). The team treating patient B decided to discontinue the VVASBK at that time and follow up in nine months. Radiograph (figure c-4) was obtained at the nineteen month follow up (wore VVASBK for ten months then discontinued for nine months) validating successful treatment using the VVASBK.



Figure c-1



Figure c-2



Figure c-3



Figure c-4

Conclusion

Orthotic management with Drop Lock or solid upright designs has been successfully used as a treatment method for Blounts disease and other bowing deformities in the lower limb. Success rate has ranged from 50% to 90% without recurrence. A commonly prescribed single solid upright designs has shown after 5.9 year follow up that of those with unilateral involvement, 6% went on to surgery while 70% of those bilaterally involved went on to surgery (Richards et al., 1998). The determination of correct etiology, age appropriateness, familial, stature, lateral thrust, radiographic evidence and documented progression are paramount to maximizing outcomes. Once identified, most often the success is linked to the individual design selected itself and the experience of the team managing the patient. Additionally, experience of the treating orthotist and follow through by the caregiver play a major role in the ultimate outcome. The results of patient B's treatment using the VVASBK validates the effectiveness of this new design following accepted protocol's established in recommending orthotic management in the infantile patient.

Evidence gathered from the results of patient A not only confirms the success of the VVASBK but further validates that patients with Blount's disease can be treated not only much later in the infantile stage but in the late onset stage as well successfully. Further success is validated in patient A's case study for treating those who are considered obese and or have bilateral involvement. Obese and bilateral involvement are two categories that have previously not been recommended for orthotic management (Herring, Tachdjian's Pediatric Orthopaedics; third edition; Vol. 2). This study confirms that the unique design of the V-Vas™ Joint System, associated features of the VVASBK and the significant improvement in compliance associated with this specific design has resulted in the optimal outcomes in treatment of the typical and atypical patients with Blount's disease. Further study with a larger number of patients and long term study would be necessary to further validate the findings of this small study. The VVASBK is a new and effective way of non invasively managing traditional and non traditional lower extremity bowing deformities and should be a primary consideration when treating such deformities.



About Joseph W. Whiteside, CO/LO

Joseph W. Whiteside CO/LO has 25 years of experience in the clinical management of the Blounts patient.

About Anatomical Concepts Inc. USA

Since 1990, Anatomical Concepts has developed industry-leading medical devices, custom-fit and custom-fabricated orthoses for both upper and lower extremities. It is a team of practitioners, designers, and manufacturers utilizing advanced technology to develop superior products that not only deliver effective outcomes, but present ease-of-use for the medical professional. The company is the original concept developer of the PRAFO, or Pressure Relief Ankle Foot Orthosis, used in medical facilities internationally.

Anatomical Concepts is headquartered in Poland, OH, and provides medical devices, services, and consulting both nationally and internationally. The company's innovative product line has inspired the procurement of eleven US product patents. Providing solutions for medical professionals and helping to improve patient outcomes is still the driving force behind the corporation. Anatomical Concepts, Inc. products are FDA registered and also carry the CE marking. All products, including the ELLIOTT and ELLIOTT II, are designed, manufactured, and trademarked by Anatomical Concepts, Inc.

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