

INTRODUCTION / PURPOSE

Hallux valgus deformity is common in individuals with cerebral palsy and other spasticity disorders due to the imbalance of the intrinsic musculature and abnormal extrinsic muscular function in the lower extremity¹. Previous literature on the treatment of hallux valgus deformity in patients with underlying spasticity disorders (e.g., cerebral palsy) historically promotes arthrodesis of the first metatarsophalangeal joint².

The percutaneous bunionectomy was trialed as an alternative treatment option for correction of hallux valgus deformity amongst this unique patient population. The technique was first described by Bosch and colleagues in 1990, and with minor modifications from the original technique was utilized to provide a joint sparing procedure within this patient group³⁺⁴. This case series explores the use of the percutaneous bunionectomy to correct hallux valgus deformity among patients with spasticity disorder.

PATIENT SELECTION

- Three young adult patients all with underlying spasticity deformities.
 - One patient with bilateral hallux valgus deformities
 - Two patients with unilateral hallux valgus deformity.
 - All four hallux valgus deformities underwent correction utilizing the percutaneous bunion technique.

Patient information is depicted in Table 1.

- Two lead attending surgeons performed the percutaneous bunion correction within three different hospital systems.
 - University of Maryland Medical Center
 - DVA Maryland
 - Rubin Institute for Advanced Orthopedics at Sinai Hospital of Baltimore
 - Both attending surgeons followed the operative technique for the percutaneous bunion deformity correction as described by Siddiqui⁵.
- All patients and/or caregivers complained of painful bunion deformity causing discomfort during ambulation, or difficulty with shoe gear, prior to operative intervention.

Table 1.

Patient	Gender	Type of Spasticity Disorder	Age at Time of Procedure	Laterality of Hallux Valgus Deformity
A	Male	Cerebral Palsy	20	Right
A	Male	Cerebral Palsy	21	Left
B	Male	CVA Injury	28	Left
C	Female	Cerebral Palsy	18	Right

OPERATIVE TECHNIQUE

Figure 1. Step 1. 2mm Kirschner wire inserted from the distal medial aspect of the great toe to the medial aspect of the head of the first metatarsal in an extraperiosteal fashion.(Figure 1).

Figure 2a. Step 2. Incision made along the medial aspect of the 1st metatarsal and a 1.8mm K-wire was inserted from medial to lateral direction (Figure 2a, 2b).

Figure 2b. 1st drill hole = "Osteotomy Guide Wire"
2nd drill hole
3rd drill hole
4th drill hole

Figure 3. Step 3. Osteotome and/or micro-sagittal saw used to complete the osteotomy (Figure 3).

Figure 4a. Step 4a. Hallux manipulated into position with simultaneous translation of the capital fragment and correction of the frontal plane deformity. (Figure 4a)

Figure 4b. Step 4b. 2mm K-wire advanced down the medullary shaft of the 1st metatarsal.(Figure 4b)

Figure 4a. Kelly hemostat guides K-wire into the proximal fragment

Figure 4b. Fragment is properly displaced

*Note: Typically a lateral release/or adjunctive soft tissue procedure is not necessary in the percutaneous bunion procedure, however the lateral release was indicated in three of our four procedures due to the severity of deformity. The lateral release was performed at the start of the procedure.

PATIENT DATA



Figure 5. Patient C's preoperative weight bearing AP radiograph with measurement of hallux abductus angle.

Table 2

Patient	Intermetatarsal Angle Pre-Op	Hallux Abductus Angle Pre-Op	Proximal Articular Set Angle Pre-Op	Tibial Sesamoid Position Pre-Op
A	11	25	21	7
A	13	27	23	6
B	10	29	11	3
C	11	34	30	6

Table 3

Patient	Lateral Release Performed	K-Wire Removed (Weeks Post-Op)	Post-Op Dressing
A	Yes	6	Short Leg Cast
A	Yes	3	Short Leg Cast
B	Yes	6	Short Leg Cast
C	No	7	Short Leg Cast

Figure 6.

Figure 6. Patient C's post operative AP radiograph with evidence of percutaneous pin fixation and short leg cast application.

- Preoperative evaluation of the hallux valgus deformities included three views of weight bearing foot radiographs. (Figure 5)
- Standard first ray angles were appropriately calculated for operative planning prior to surgical intervention. Pre-operative hallux valgus angles are listed in Table 2.
- All patients were placed in a non-weight bearing short leg cast following operative intervention. (Figure 6)
- Post operative follow up visits with the attending surgeons were performed at two-three week intervals until percutaneous K-wire fixation was removed.
- Radiographic evaluation of overall hallux valgus deformity correction were obtained from AP radiographs taken at patient's postoperative follow up visit. (Figure 7)
- All patients maintained adequate correction of bunion deformity with no evidence of recurrence.

Results of hallux valgus deformity correction are listed in Table 4 under the Results Section.

RESULTS

Table 4

Patient	Intermetatarsal Angle Post-Op	Hallux Abductus Angle Post-Op	Proximal Articular Set Angle Post-Op	Tibial Sesamoid Position Post-Op
A	6	5	5	4
A	7	6	11	3
B	7	10	6	1
C	7	5	5	3

Comparison of pre-operative to post-operative radiographic values were calculated and averaged for overall deformity correction amongst the four different procedures. These results are listed in Table 5. Amongst four hallux valgus deformity corrections there was an average correction of 4.5 degrees at the Intermetatarsal angle, an average 21.75 degree correction for the hallux abductus angle, an average 14.5 degree correction for the proximal articular set angle and an average tibial sesamoid position translocation of 2.75 positions.

Table 5

Average Correction	Intermetatarsal Angle	Hallux Abductus Angle	Proximal Articular Set Angle	Tibial Sesamoid Position
	4.5	21.75	14.5	2.75

All of the patients tolerated the operation and postoperative course well with no complications. To date, no recurrence of the hallux valgus deformity has been reported.

CONCLUSION

Based on the successful results of this small case series, the two lead surgeons suggest that the percutaneous bunion procedure be considered as a treatment option for correction of hallux valgus deformity in patients with an underlying spasticity disorder.

This case series depicts the need for further research involving the percutaneous bunionectomy procedure while incorporating a larger patient population and long term follow up (i.e. 5-10 years) after hallux valgus deformity correction.

Overall, this series provides a joint sparing treatment option for patients with spasticity disorders and should be considered as an option for skilled and able surgeons, when appropriate.

REFERENCES

- Bishay, Sherif N. G., et al. "Great Toe Metatarsophalangeal Arthrodesis for Hallux Valgus Deformity in Ambulatory Adolescents with Spastic Cerebral Palsy." *Journal of Childrens Orthopaedics*, vol. 3, no. 1, 2009, pp. 47-52.
- David, Jon R., et al. "Surgical Management of Hallux Valgus Deformity in Children with Cerebral Palsy." *Journal of Pediatric Orthopaedics*, 2001, pp. 89-94.
- Bosch P, Markowski H, Rannicher V. Technik und Erste Ergebnisse der Subkutanen Distalen Metatarsale, I Osteotomie. *Orthopaedische Praxis*. 1990; 26:51-56.
- Bosch P, Wanke S, Legenstein R. Hallux valgus correction by the method of Bosch: a new technique with a seven-to-ten-year follow-up. *Foot Ankle Clin*.2000;5(3):485-98S.
- Siddiqui, Noman A. "A Guide To The Percutaneous Bunionectomy." *Podiatry Today*, 19 May 2016.