

## Does the Minimally Invasive Chevron and Akin Bunionectomy Impact Clinical and Radiographic Outcomes in Patients with Asymptomatic Flatfoot?

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**INTRODUCTION:** Hallux valgus is a common forefoot pathology that often presents with secondary structural deformities, such as flatfoot. While symptomatic flatfoot can be treated with separate procedures at the time of hallux valgus correction, the question remains whether asymptomatic flatfoot should be addressed. Although prior studies have shown that patient-reported outcomes and radiographic correction from the Lapidus procedure and scarf osteotomy are not affected by the presence of asymptomatic flatfoot, this has not been previously studied for the minimally invasive chevron and akin bunionectomy (MISB), an increasingly popular method of treating hallux valgus due to benefits of early weight-bearing and less pain. Therefore, the objective of this study was to compare patient-reported outcomes and postoperative radiographic measures in patients with isolated hallux valgus to those with concomitant asymptomatic flatfoot who underwent the MISB procedure.

### **METHODS:**

This retrospective cohort study included patients treated by 2 fellowship-trained foot and ankle surgeons who have been performing MIS bunionectomy for at least 3 years. Patients were included if they were over 18 years of age, underwent a MISB procedure to correct a hallux valgus deformity, had minimum 1-year and up to 2-year postoperative PROMIS scores, and had preoperative and minimum 3-month postoperative radiographs. Patients were excluded if they had any prior procedure on the ipsilateral forefoot. A total of 82 patients met the inclusion and exclusion criteria. Patients were allocated into an “asymptomatic flatfoot” group based on the following radiographic criteria devised by Flores et al: Meary’s angle > 4 degrees, calcaneal pitch (CP) < 18 degrees, and talonavicular coverage angle (TNCA) > 7 degrees. A total of 35 patients met these criteria, with the remaining 47 classified as the “control” group. All patients completed PROMIS surveys in the Physical Function, Pain Interference, Pain Intensity, Global Physical Health, Global Mental Health, and Depression domains preoperatively and minimum 1-year postoperatively. Preoperative, postoperative, and preoperative to postoperative change in PROMIS scores were compared between the groups. Radiographic outcomes including hallux valgus angle (HVA), intermetatarsal angle (IMA), Meary’s angle, CP, and TNCA were measured and compared preoperatively and minimum 3 months postoperatively. For statistical analysis, paired t-tests were used to assess improvement within groups, and Student’s t-tests were employed to compare PROMIS and radiographic outcomes between groups.

### **RESULTS:**

A total of 82 patients were included in the final analysis. The “asymptomatic flatfoot” group contained 35 patients having an average PROMIS follow up of 15.7 months, while the “control” group had 47 patients with an average PROMIS follow up of 15.5 months. The average age, BMI, and gender were similar between groups (Table 1). Both groups demonstrated similar preoperative as well as postoperative PROMIS scores with significant improvements in PROMIS physical function, pain interference, pain intensity, and global physical health. There were no significant preoperative to postoperative changes in PROMIS global mental health and depression domains in either group (Table 2). Both cohorts had a similar mean radiographic follow up (control 6.8 months, flatfoot 7.2 months). Preoperative and postoperative HVA and IMA were similar between both groups, however patients in the flatfoot group had a significantly higher Meary’s angle, TNCA, and a lower CP preoperatively as well as postoperatively (Table 3). In comparing preoperative to postoperative radiographic changes, both groups demonstrated significant improvements in HVA, IMA, and TNCA. Only patients in the control group had a significant increase in Meary’s angle (higher = worse) while only patients in the flatfoot group showed a significant increase in CP (higher = better) [Table 3]. Complication rates were similar between groups.

### **DISCUSSION AND CONCLUSION:**

When comparing patients with isolated hallux valgus to those with concomitant asymptomatic flatfoot, our study indicates that the MISB procedure results in similar postoperative PROMIS scores between groups as well as significant preoperative to postoperative improvement within each group. In terms of radiographic outcomes, patients in both groups demonstrated similar significant correction of their hallux valgus deformity, however the flatfoot parameters remained unchanged. Despite the statistically significant increase in Meary’s angle in the control group, this does not appear to be clinically significant due to the small magnitude of change. Additionally, although the MISB procedure was not able to normalize the flatfoot parameters, this did not seem to affect patient-reported outcomes 1-2 years after surgery. Therefore, the MIS bunionectomy may be an effective option for hallux valgus correction in patients with mild, asymptomatic flatfoot, though longer-term follow up is needed to determine if outcomes are influenced by further progression of the flatfoot.

**Table 2: Preoperative and Postoperative PROMIS Scores in Control and Asymptomatic Flatfoot Patients Following MISB Procedure**

	Control		Asymptomatic Flatfoot		P-value*
	Preoperative	Postoperative	Preoperative	Postoperative	
<b>Physical Function</b>	48.7 ± 6.4	54 ± 8.1	48.6 ± 7.1	52.9 ± 7.7	0.5
<b>Pain Interference</b>	54 ± 6.3	45.9 ± 7.5	53.1 ± 5.8	47.7 ± 7.5	0.1
<b>Pain Intensity</b>	46.5 ± 6.3	36.6 ± 6.6	45.6 ± 7	38.9 ± 7.1	0.07
<b>Global Physical Health</b>	51.9 ± 7.9	55.1 ± 8.5	51.5 ± 6.2	54.1 ± 8.8	0.6
<b>Global Mental Health</b>	55.6 ± 8.5	57.1 ± 7.8	55.4 ± 8.1	55.3 ± 9	0.4
<b>Depression</b>	45.2 ± 8.6	44.7 ± 7.5	47.5 ± 7.3	47.2 ± 9.1	0.2

Data presented as mean ± SD

\*Comparison of postoperative PROMIS scores between groups

**Table 1: Demographics of Control and Asymptomatic Flatfoot Patients Who Underwent MISB Procedure**

	Control (n = 47)	Asymptomatic Flatfoot (n = 35)	P-value
<b>Age</b>	57.4 ± 15.3	56.7 ± 12.3	0.8
<b>Sex, n (%)</b>			
<b>Male</b>	5 (11)	4 (11)	0.9
<b>Female</b>	42 (89)	31 (89)	
<b>BMI</b>	23.4 ± 3.6	23.5 ± 4.7	0.9

Data presented as mean ± SD

**Table 3: Preoperative and Postoperative Radiographic Measurements Following MISB Procedure in Control and Asymptomatic Flatfoot Patients**

	Control		Asymptomatic Flatfoot		P-value*
	Preoperative	Postoperative	Preoperative	Postoperative	
<b>HVA</b>	28.1 ± 9	7.7 ± 7.9	28.7 ± 7.2	6.8 ± 6	0.6
<b>BMA</b>	13.6 ± 3.1	3.1 ± 3.2	14.3 ± 3	2.8 ± 2.2	0.7
<b>Mear's Angle</b>	4 ± 6.3	5.1 ± 5.4	11.7 ± 5.6	11.1 ± 5.5	<0.001
<b>CP</b>	22 ± 3.9	22 ± 4.2	15.5 ± 2.3	15.9 ± 2.6	<0.001
<b>TNCA</b>	12.9 ± 8.5	10.4 ± 7.5	19.7 ± 7	15.8 ± 6.5	<0.001

Data presented as mean ± SD

\*Comparison of postoperative radiographic measurements between groups