



## Comparison of the Modified McBride Procedure and the Distal Chevron Osteotomy for Mild to Moderate Hallux Valgus



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### ABSTRACT

Distal metatarsal osteotomy and the modified McBride procedure have each been used for the treatment of mild to moderate hallux valgus. However, few studies have compared the results of these 2 procedures for mild to moderate hallux valgus. The purpose of the present study was to compare the results of distal chevron osteotomy and the modified McBride procedure for treatment of mild to moderate hallux valgus according to the severity of the deformity. We analyzed the data from 45 patients (49.5%; 48 feet [49.0%]), who had undergone an isolated modified McBride procedure (McBride group), and 46 patients (50.5%; 50 feet [51.0%]), who had a distal chevron osteotomy (chevron group). We subdivided each group into those with mild and moderate deformity and compared the clinical and radiologic outcomes between the groups in relation to the severity of the deformity. The improvements in the American Orthopaedic Foot and Ankle Society scale score and the visual analog scale for pain were significantly better for the chevron group for both mild and moderate deformity. The chevron group experienced significantly greater correction in the hallux valgus angle and intermetatarsal angle for both mild and moderate deformity. The chevron group experienced a significantly greater decrease in the grade of sesamoid displacement for patients with moderate deformity. The McBride group had a greater risk of recurrence than did the chevron group for moderate deformity (odds ratio 14.00, 95% confidence interval 3.91 to 50.06,  $p < .001$ ). The results of the present study have demonstrated the superiority of the distal chevron osteotomy over the modified McBride procedure for mild to moderate deformity. For patients with moderate deformity, the McBride group had a greater risk of hallux valgus recurrence than did the distal chevron group. Therefore, we recommend distal chevron osteotomy rather than a modified McBride procedure for the treatment of mild and moderate hallux valgus.

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The selection of a procedure to treat hallux valgus deformity is determined by the severity of the deformity and the magnitude of the intermetatarsal angle (IMA) (1). For mild to moderate hallux valgus deformity, distal osteotomies of the first metatarsal or the modified McBride procedure are performed (2–4). For more severe deformity, more proximal first metatarsal osteotomies have been recommended (5).

Distal metatarsal osteotomies can effectively correct mild to moderate deformity, and the chevron osteotomy has become widely accepted (6). Some investigators have reported that an isolated modified McBride procedure without metatarsal osteotomy leads to

favorable outcomes in patients with mild to moderate deformity (2,3,7). Although each of these procedures has been used to treat mild to moderate hallux valgus deformity, few studies (2,8,9) have compared the clinical and radiologic outcomes of these procedures. They all described their results without distinction regarding the severity of the deformity.

The purpose of the present study was to assess the results of distal chevron osteotomy and the modified McBride procedure for the treatment of mild to moderate hallux valgus deformity and to compare the results according to the severity of the deformity.

### Patients and Methods

The hospital's institutional review board approved the present study. We retrospectively reviewed the medical records of 54 patients (57 feet) who had undergone an isolated modified McBride procedure without metatarsal osteotomy and 59 patients (63 feet) who had undergone a distal chevron osteotomy from April 2004 to November

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2011 for the treatment of symptomatic hallux valgus. All operations were performed by the senior author (T.S.K.), and he sequentially undertook the 2 different procedures. The modified McBride procedures were performed in the first half of the present study, and distal chevron osteotomies were performed in the second half. The inclusion criteria were a painful bunion and hallux valgus deformity refractory to nonoperative management, mild to moderate hallux valgus with an incongruent first metatarsophalangeal joint, the availability of dorsoplantar weightbearing radiographs of the feet that had been taken preoperatively and at the final follow-up visit, and a minimum follow-up period of 2 years. The exclusion criteria were hallux rigidus, rheumatoid arthritis, previous failed hallux valgus surgery, and combined procedures other than the distal chevron osteotomy or the modified McBride procedure. In all, 9 patients (8.0%) were lost to follow-up, and 13 patients (11.5%) were excluded from the study: 3 patients (2.7%) with rheumatoid arthritis, 1 (0.9%) with failed previous surgery, and 9 (8.0%) who had undergone combined procedures other than the index procedures. A total of 91 patients (98 feet; 80.5% of the potentially eligible patients and 81.7% of the potentially eligible feet) were finally enrolled in the present study. The patients were divided into 2 groups according to the surgical technique: 45 patients (49.5%; 48 feet [49.0%]) had undergone an isolated modified McBride procedure (McBride group) and 46 patients (50.5%; 50 feet [51.0%]) had undergone distal chevron osteotomy (chevron group). In accordance with Coughlin (1), we subdivided each group into those with mild (hallux valgus angle [HVA]  $<20^\circ$  and/or an IMA  $\leq 11^\circ$ ) and moderate (HVA  $20^\circ$  to  $40^\circ$  and/or IMA  $<16^\circ$ ) hallux valgus deformity. The patient demographics and preoperative radiologic parameters are listed in Table 1. No significant differences were found between the McBride and chevron groups regarding all these variables.

#### Surgical Technique

The procedures were performed with the patients in the supine position under spinal anesthesia. For the modified McBride procedure, the adductor hallucis tendon and transverse intermetatarsal ligament were released sharply through a dorsal first web space incision. The lateral capsule of the first metatarsophalangeal joint was perforated using several stab incisions. After a longitudinal medial capsulotomy, the medial eminence of the first metatarsal head was removed in line with the metatarsal shaft. The stump of the adductor hallucis tendon was sutured into the lateral aspect of the first metatarsal neck, and the medial capsule was plicated in slight overcorrection. For the distal chevron osteotomy, the medial eminence was excised, and no lateral soft tissue release was performed. After a  $60^\circ$  V-osteotomy centered on the first metatarsal head, the capital fragment was displaced laterally, and the osteotomy was fixed with a 3.0-mm cannulated screw (Barouk Screw<sup>®</sup>; DePuy International, Leeds, UK). The medial capsule was imbricated in slight overcorrection.

Postoperatively, each patient wore an open, hard-soled postoperative shoe and was allowed to bear weight as tolerated on the heel and lateral forefoot on the first postoperative day. Use of the postoperative shoe was typically discontinued at 4 weeks in the McBride group and at 4 to 6 weeks in the chevron group after radiographic evidence of healing at the osteotomy site.

#### Clinical and Radiographic Evaluations

All patients were evaluated clinically before surgery and at the final follow-up visit. The clinical outcomes were assessed using the American Orthopaedic Foot and Ankle Society (AOFAS) forefoot-metatarsophalangeal-interphalangeal scale (10) and a visual analog scale (VAS) (11) for pain. The patients were also asked whether they were very satisfied, satisfied, unsatisfied, or very unsatisfied with the surgical outcome and whether they would undergo the same procedure again.

Radiographic assessment was performed with weightbearing dorsoplantar and lateral radiographs pre- and postoperatively. On weightbearing dorsoplantar radiographs, 1 independent observer who did not participate in the operative treatment and who was unaware of the purpose of the study measured the HVA, IMA, and the position of the medial sesamoid preoperatively and at the final follow-up visit. The HVA was measured as the angle between the line from the center of the first metatarsal base to the center of the first metatarsal head and the line connecting the midpoints of the proximal and distal articular surfaces of the proximal phalanx (12). The IMA was

**Table 1**  
Demographics of McBride and chevron groups

Variable	McBride Group (n = 48)	Chevron Group (n = 50)	p Value
Age (y)	55.8 ± 11.5	57.9 ± 11.9	.260
Gender			.959
Male	18 (37.5)	19 (38.0)	
Female	30 (62.5)	31 (62.0)	
Follow-up duration (mo)	48.35 ± 23.8	51.3 ± 19.1	.581
Hallux valgus angle ( $^\circ$ )	26.5 ± 7.2	27.6 ± 5.9	.379
Intermetatarsal angle ( $^\circ$ )	11.7 ± 2.3	11.9 ± 1.9	.771
Sesamoid position (grade)	5.8 ± 0.8	5.9 ± 0.9	.688

Data presented as mean ± standard deviation or n (%).

measured as the angle between the line of the first metatarsal and the line bisecting the diaphyseal portions of the second metatarsal bone (13). The position of the medial sesamoid was categorized into 1 of 7 grades in accordance with the methods of Hardy and Clapham (14). Similar to previous studies (15,16), we defined the recurrence of hallux valgus as an HVA  $>15^\circ$ , and we assessed hallux valgus recurrence at the final follow-up examination in all patients.

#### Statistical Analysis

All statistical analyses were performed with SPSS software for Windows, version 16.01 (SPSS Inc., Chicago, IL). The Student *t* test or Mann-Whitney *U* test were used to compare the continuous variables between groups, and the Wilcoxon signed rank test was used to evaluate the changes between the pre- and postoperative values. The chi-square test or Fisher's exact test was used to compare the nominal variables. The odds ratio for hallux valgus recurrence and 95% confidence interval were calculated using the chi-square test. A *p* value  $< .05$  was considered statistically significant.

#### Results

The clinical outcomes are summarized in Table 2. The mean AOFAS scores for the McBride and chevron groups improved significantly for both mild ( $p = .008$  and  $p = .01$ , respectively) and moderate ( $p < .001$  and  $p < .001$ , respectively) deformity. The mean preoperative AOFAS score did not differ significantly between the McBride and chevron groups; however, the mean postoperative AOFAS scores and the mean change in the AOFAS scores were significantly greater in the chevron group than in the McBride group for both

**Table 2**  
Clinical outcomes

Variable	McBride Group (n = 48)	Chevron Group (n = 50)	p Value
Mild deformity	21 (43.8)	20 (40.0)	
AOFAS scale score			
Preoperatively	58.9 ± 5.4	57.1 ± 3.8	.22
Final follow-up visit	87.2 ± 3.3	91.5 ± 1.6	.004
Difference	28.3 ± 8.0	34.4 ± 2.6	.04
p Value	.008	.01	
VAS score			
Preoperatively	6.9 ± 0.9	7.4 ± 1.5	.43
Final follow-up visit	2.8 ± 0.9	1.2 ± 0.9	.007
Difference	4.3 ± 0.9	6.4 ± 0.8	.002
p Value	.007	.01	
Overall satisfaction			.65
Very satisfied	9 (42.9)	8 (40.0)	
Satisfied	7 (33.3)	6 (30.0)	
Unsatisfied	3 (14.3)	3 (15.0)	
Very unsatisfied	2 (9.5)	3 (15.0)	
Same surgery again			.69
Yes	16 (76.2)	17 (85.0)	
No	5 (23.8)	3 (15.0)	
Moderate deformity	27 (56.2)	30 (60.0)	
AOFAS scale score			
Preoperatively	55.2 ± 6.7	54.9 ± 5.2	.88
Final follow-up visit	84.7 ± 7.3	89.6 ± 3.5	.01
Difference	29.7 ± 8.4	34.7 ± 5.4	.02
p Value	$<.001$	$<.001$	
VAS score			
Preoperatively	6.9 ± 1.6	7.2 ± 1.3	.88
Final follow-up visit	3.3 ± 2.3	1.4 ± 1.4	.001
Difference	3.6 ± 3.2	5.7 ± 1.2	.003
p Value	.001	$<.001$	
Overall satisfaction			.15
Very satisfied	5 (18.5)	13 (43.3)	
Satisfied	12 (44.4)	11 (36.7)	
Unsatisfied	7 (25.9)	3 (10.0)	
Very unsatisfied	3 (11.1)	3 (10.0)	
Same surgery again			.14
Yes	18 (66.7)	25 (83.3)	
No	9 (33.3)	5 (16.7)	

Abbreviations: AOFAS, American Orthopaedic Foot and Ankle Society; VAS, visual analog scale.

Data presented as n (%) or mean ± standard deviation.

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