■ FOOT & ANKLE

Two techniques of transarticular distal soft-tissue release combined with distal chevron osteotomy for hallux valgus

A PROSPECTIVE RANDOMIZED STUDY

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Aims
This study aimed to determine differences in radiological and clinical outcomes between two groups with hallux valgus deformity who underwent distal chevron osteotomy and two different types of transarticular distal soft-tissue release. In one group, transarticular release was performed with lateral metatarsosesamoid suspensory ligament (MSL) release, whereas in the other, MSL release was not performed.

Methods
A total of 76 patients were randomized into two groups: distal chevron osteotomy with transarticular soft-tissue release either including lateral MSL release (Group A, n = 39) or without lateral MSL release (Group B, n = 37). The primary outcome was the hallux valgus angle (HVA) at 12 months postoperatively, with secondary outcomes including the inter-metatarsal angle (IMA), sesamoid position, Foot and Ankle Outcome Score (FAOS), Foot Functional Index (FFI), visual analogue scale (VAS) for pain, patient satisfaction, and first metatarsophalangeal (MTP) joint range of motion (ROM). Sub-group analysis was performed to investigate differences in the effect of distal soft-tissue release with regard to the severity of the deformity.

Results
At the 12-month follow-up, both groups showed significant improvements in radiological parameters (HVA, IMA, and sesamoid position) and functional scores (FAOS, FFI, and VAS pain), with no significant differences between groups overall. Patient satisfaction and ROM of the first MTP joint also showed no significant differences between the groups. In the sub-group analysis, there were no significant differences between the groups in mean preoperative HVA and IMA for both moderate and severe deformities. At 12 months postoperatively, mean HVA and IMA did not differ significantly between the groups with moderate deformities, whereas they were significantly lower in Group A than in Group B in severe deformities.

Conclusion
Lateral MSL release is not essential for treating moderate hallux valgus deformities with distal chevron osteotomy and transarticular distal soft-tissue release. However, lateral MSL release may be beneficial in patients with severe deformities.

Cite this article: *Bone Joint J* 2025;107-B(11):1196–1202.

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doi:10.1302/0301-620X.107B11.BJJ-2024-1666.R1 $2.00

Bone Joint J
2025;107-B(11):1196–1202.

Introduction

Hallux valgus, a bony structural deformity of the foot, is thought to be caused mainly by the imbalance of soft-tissues, including the muscle and tendon structures around the first metatarsophalangeal joint.[1,2]

The main soft-tissues that generate valgus deformities are the metatarsosesamoid suspensory ligament (MSL), the adductor hallucis tendon, the lateral metatarsophalangeal capsule, and the inter-metatarsal ligament. An incongruent joint is usually an indication for soft-tissue release, and

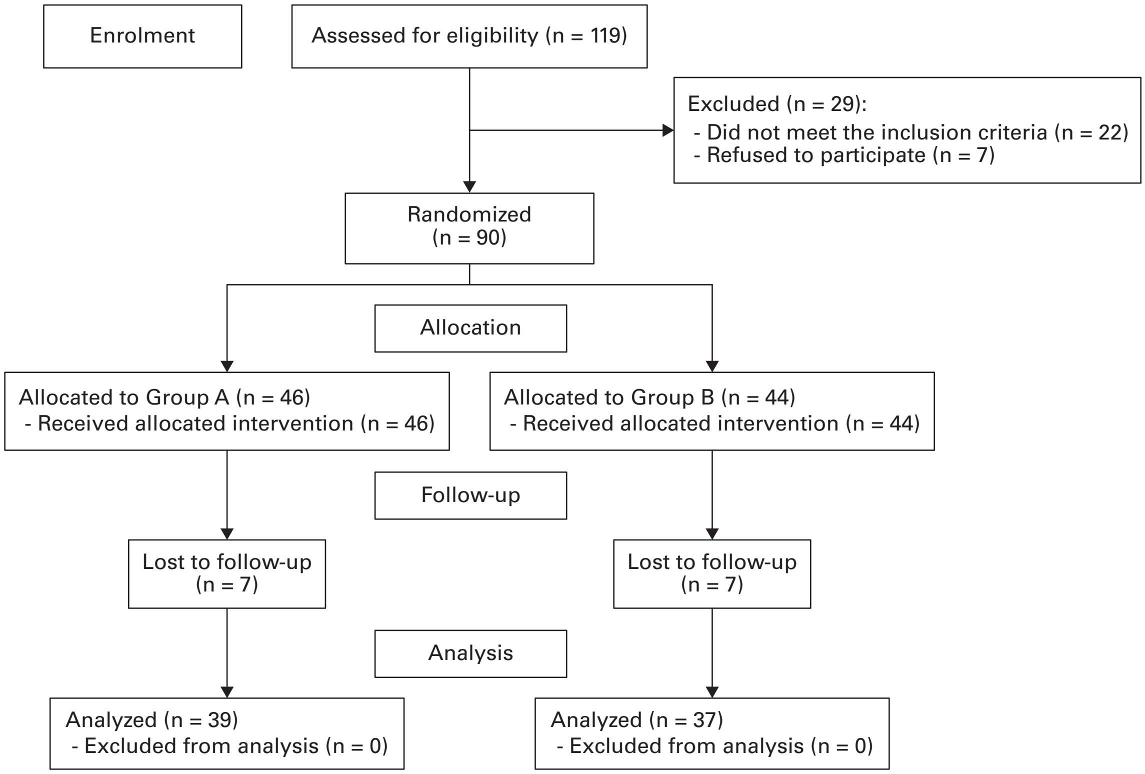

Fig. 1

CONSORT (Consolidated Standards of Reporting Trials) flow diagram.

first metatarsal osteotomy is recognized as essential in patients with moderate-to-severe hallux valgus.

Two approaches are generally used for distal soft-tissue release: the dorsal first web space approach and the medial transarticular approach.[3] In a previous study comparing these two approaches, the authors found that the clinical and radiological outcomes were comparable between the two approaches.[4] The transarticular approach does not require an additional incision, and results in less scarring.[5] Two techniques are commonly used for transarticular distal soft-tissue release, and the target soft-tissue to be released differs depending on the technique.[4-7] In one technique, the lateral MSL, lateral capsule of the first metatarsophalangeal (MTP) joint, and adductor hallucis tendon are released, whereas in the other technique, only the lateral MTP joint capsule and adductor hallucis tendon are released.[4-6,8]

In some biomechanical and anatomical studies, it was reported that lateral MSL release is crucial for successful distal soft-tissue release in hallux valgus surgery, whereas adductor hallucis tendon release did not significantly contribute to the correction of hallux valgus.[9-11]

Although the outcomes of the two transarticular release techniques may differ, there are as yet no published studies in which the actual patient outcomes of the two techniques were compared.

Accordingly, we aimed to determine whether there were any differences in radiological or clinical outcomes between the two techniques of transarticular distal soft-tissue release (with or without lateral MSL release) when combined with distal chevron osteotomy to correct the hallux valgus deformity. We hypothesized that there would be significant differences in the radiological outcomes between the two techniques for transarticular distal soft-tissue release.

Methods

This study was an institutional review board-approved (AS16023), randomized controlled trial registered at the Clinical Research Information Services (identifier KCT0002347). Patients were included in the study if they met the following criteria: aged over 19 years, painful bunion, failure of conservative treatment, HVA > 20° and inter-metatarsal angle (IMA) > 10°, and incongruency of the first MTP joint. The exclusion criteria were arthritis of the first MTP joint, previous surgery to ipsilateral foot and ankle, inflammatory disease, need for simultaneous lesser toe procedures, and instability of the first tarsometatarsal joint. Between January 2017 and October 2019, 90 eligible patients were enrolled and randomized into two groups at two institutions: Korea University Ansan Hospital, and Korea University Guro Hospital (Figure 1). Informed consent was obtained from all patients. In both groups, the type of metatarsal osteotomy performed was a distal chevron osteotomy, and a medial transarticular approach was used for the distal soft-tissue procedure. In Group A, the lateral MSL, lateral capsule of the first MTP joint, and adductor hallucis tendon were released, whereas only the lateral capsule of the first MTP joint and adductor hallucis tendon were released in Group B. A dedicated study coordinator (see Acknowledgements) generated a randomization list of patients using computer-based

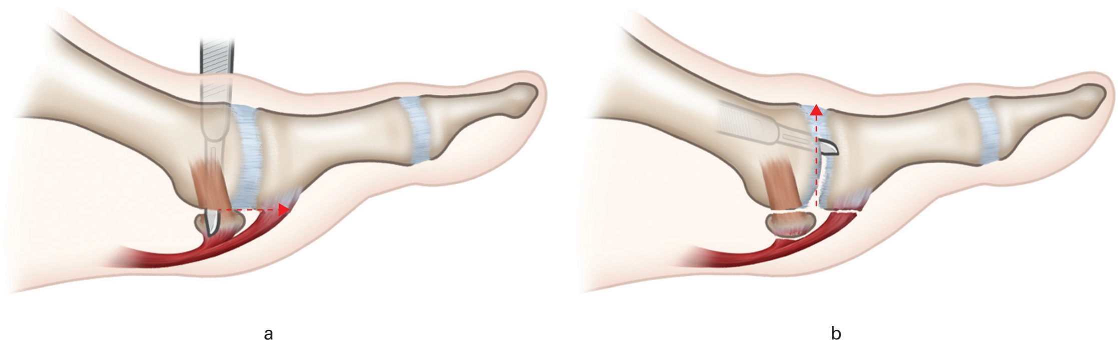

Fig. 2

Transarticular distal soft-tissue release with release of the lateral metatarsosesamoid suspensory ligament (MSL). a) The lateral MSL and the conjoined tendon of the adductor hallucis muscle were released followed by b) release of the lateral capsule of the first metatarsophalangeal joint.

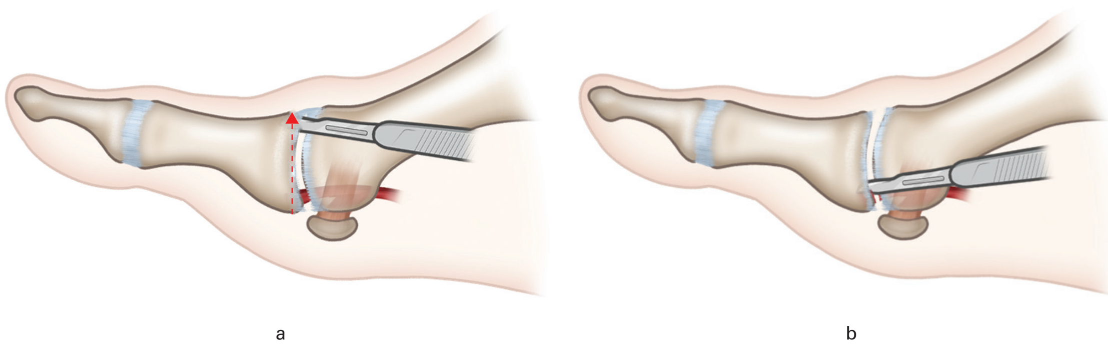

Fig. 3

Transarticular distal soft-tissue release without lateral metatarsosesamoid suspensory ligament release. a) A lateral vertical capsulotomy of the first metatarsophalangeal joint was performed and, b) after which the adductor hallucis tendon was released.

block randomization, with an allocation of 1:1 and block sizes of four.

Of the 90 enrolled patients, 46 were randomized into Group A and 44 into Group B. During the one-year follow-up, seven patients in each group were unavailable for follow-up. There were no statistically significant differences between the two groups in terms of preoperative patient characteristics (Table I).

Surgical procedure. At the two institutions, the surgical techniques were uniform, with each institution having a single dedicated foot and ankle orthopaedic surgeon (GWC, HJK) to perform the procedures.

An incision was made longitudinally on the medial side of the first MTP joint, followed by medial longitudinal capsulotomy along the same line. Transarticular release was used for the distal soft-tissue procedure. In Group A, a small bone hook was used to elevate the first metatarsal head, and a Senn retractor was used to expose the lateral sesamoid. To release the lateral MSL and the conjoined tendon of the adductor hallucis muscle, a no. 15 blade was positioned between the metatarsal head and the lateral sesamoid, and slid from proximal to distal along the lateral margin of the lateral sesamoid until the blade abutted against the base of the proximal phalanx (Figure 2a). The blade was rotated 90°, and the incision was extended dorsally to release the lateral capsule of the first MTP joint (Figure 2b). In Group B, a no. 15 blade was positioned between the metatarsal head and base of the proximal phalanx. Lateral vertical capsulotomy was performed (Figure 3a), after which the adductor hallucis tendon was severed (Figure 3b).

The medial eminence was removed using a sagittal saw positioned 1 mm medial to the sagittal sulcus in the distal-proximal direction. A 60° V-shaped osteotomy was performed on the first metatarsal head with the apex located distally for distal chevron osteotomy, moving the head fragment laterally and fixing it with a 1.4 mm Kirschner (K-) wire. After evaluating the degree of correction, the sesamoid position, and the first metatarsal head rotation on fluoroscopy under a load simulation test on the table, one or two additional 1.4 mm K-wires were inserted. An additional Akin osteotomy was performed when the great toe exhibited excessive contact with the second toe or when the pronation deformity of the great toe persisted intraoperatively under a load simulation test, even after metatarsal osteotomy. Fixation was achieved using a 3.0 mm headless compression screw (DePuy Synthes, USA). The excess medial capsule was trimmed during capsulorrhaphy.

Both groups of patients received the same postoperative care. For six weeks after surgery, all patients were required to wear a

Table I. Patient demographics.

Variable	Group A	Group B	p-value
Patients, n	39	37	
Mean age, yrs (SD)	57.1 (10.2)	55.3 (14.2)	0.538*
Sex, n (%)			0.674†
Male	5 (12.8)	6 (16.2)	
Female	34 (87.2)	31 (83.8)	
Mean BMI, kg/m^2 (SD)	24.5 (3.6)	23.2 (2.6)	0.099*
Side, n (%)			0.799†
Right	21 (53.8)	21 (56.8)	
Left	18 (46.2)	16 (43.2)	
Akin osteotomy, n (%)	34 (87.2)	33 (89.2)	0.786†

*Independent-samples *t*-test.
†Chi-squared test.

Table II. Radiological outcomes.

Variable	Group A	Group B	p-value
Mean hallux valgus angle, ° (SD)			
Preoperative	31.0 (10.30)	34.5 (9.8)	0.133*
12 mths postoperative	9.7 (5.4)	11.4 (6.1)	0.203*
p-value	< 0.001†	< 0.001†	
Mean inter-metatarsal angle,° (SD)			
Preoperative	14.6 (4.0)	14.5 (3.5)	0.875*
12 mths postoperative	7.7 (1.9)	8.6 (3.7)	0.169*
p-value	< 0.001†	< 0.001†	
Mean medial sesamoid position grade (SD)			
Preoperative	5.4 (1.1)	5.3 (0.9)	0.738‡
12 mths postoperative	3.4 (1.1)	3.7 (0.9)	0.327‡
p-value	< 0.001§	< 0.001§	

*Independent-samples *t*-test.
†Paired *t*-test.
‡Mann-Whitney U test.
§Wilcoxon signed-rank test.

shoe with a hard, open sole and put weight on their heel starting on the first day after the operation. After six weeks, they were permitted to switch back to their regular footwear.

Outcome measures. Weightbearing dorsoplantar and lateral radiographs of the foot were obtained preoperatively and at three, six, and 12 months postoperatively. An independent examiner (YHP) conducted the radiological evaluations using a digital picture archiving and communication system. Measurements of the HVA,[12] IMA,[13] and medial sesamoid position were performed in weightbearing dorsoplantar views. The medial sesamoid position was graded on a seven-point scale relative to the first metatarsal longitudinal bisector, with 1 being the most medial and 7 the most lateral.[14]

Clinical outcomes were assessed preoperatively and at three, six, and 12 months postoperatively using the Foot and Ankle Outcome Score (FAOS),[15] Foot Function Index (FFI),[16] and visual analogue scale (VAS)[17] for pain. Patient satisfaction was also evaluated at each follow-up, with options of 'very satisfied', 'satisfied', or 'not satisfied'. A blinded independent examiner (DHS) assessed the passive range of motion (ROM) of the first MTP joint using a transparent plastic standard orthopaedic goniometer.

The operating time was calculated from the incision to the final skin closure, which was entered at the time of the procedure by the circulating nurse. The primary outcome was the HVA at 12 months postoperatively. The secondary outcomes were other radiological parameters and functional outcomes.

Statistical analysis. The sample size for this study was calculated on the basis of the HVA reported in a previous study.[18] Group sample sizes of 36 and 36 achieve 80.601% power to reject the null hypothesis of equal means when the population mean difference is $\mu1-\mu2 = 17.7-12.5 = 5.2$, with SDs of 8 for Group A and 7.4 for Group B, and with a significance level (α) of 0.05 using a two-sided paired unequal-variance *t*-test. After adjusting the sample size to a dropout rate of 20%, the final sample size was 45 in each group. Sample size was calculated using the PASS 2021 Power Analysis and Sample Size software (NCSS, USA). All continuous data were assessed for normal distribution using the Kolmogorov-Smirnov test. To compare continuous variables between groups, either the independent-samples *t*-test or the Mann-Whitney U test was applied. Changes between preoperative and postoperative values within the same group were evaluated using the paired *t*-test or Wilcoxon signed-rank test. Categorical variables were compared using the chi-squared test or Fisher's exact test.

An exploratory sub-group analysis was performed to investigate for differences in the effect of distal soft-tissue release with regard to the severity of the deformity. Patients were classified into two groups based on the severity of hallux valgus deformity: moderate (HVA 20° to 40° and/or IMA 11° to 16°) and severe (HVA > 40° and/or IMA > 16°).[19] Subsequently, within each severity group, the outcomes were compared between groups A and B. Statistical significance was set at $p < 0.05$. Statistical analyses were performed using SPSS Statistics for Windows v. 25 (IBM, USA).

Results

Radiological outcomes. The radiological outcomes are shown in Table II. The mean HVA and IMA values and sesamoid position grades had significantly decreased at 12 months postoperatively compared to the preoperative values in both groups. There were no significant differences between the groups regarding HVA, IMA, and sesamoid position grades both preoperatively and 12 months after surgery.

Functional outcomes. The functional outcomes are presented in Table III. The FAOS subscale, FFI, and VAS scores for pain improved significantly at 12 months postoperatively compared with the preoperative values in the two groups. There were no significant differences between the two groups, either before the operation or 12 months after. Patient satisfaction did not differ significantly at 12 months postoperatively between the two groups. The ROM values of the first MTP joint are summarized in Table IV. Dorsiflexion, plantar flexion, and total ROM preoperatively and 12 months postoperatively did not differ significantly between the two groups. Complications were observed in two cases across both study groups: one patient in Group A developed a superficial wound infection, which was successfully treated with oral antibiotics, and one patient in Group B presented with wound dehiscence that resolved with simple dressing.

Table III. Functional outcomes.

Variable	Group A	Group B	p-value
Mean FAOS (SD)			
Pain			
Preoperative	54.2 (18.7)	55.3 (18.1)	0.795*
12 mths postoperative	93.4 (5.9)	91.7 (7.5)	0.266*
p-value	< 0.001†	< 0.001†	
Symptoms			
Preoperative	55.2 (18.7)	56.3 (18.1)	0.795*
12 mths postoperative	90.8 (8.5)	91.2 (7.0)	0.859*
p-value	< 0.001†	< 0.001†	
ADL			
Preoperative	42.2 (25.3)	39.8 (19.3)	0.646*
12 mths postoperative	94.5 (4.7)	94.7 (4.9)	0.822*
p-value	< 0.001†	< 0.001†	
Sports			
Preoperative	65.1 (11.2)	66.6 (7.6)	0.503*
12 mths postoperative	88.1 (10.4)	89.3 (8.1)	0.586*
p-value	< 0.001†	< 0.001†	
QoL			
Preoperative	73.3 (15.7)	77.0 (12.2)	0.249*
12 mths postoperative	92.3 (12.2)	92.9 (12.1)	0.2835*
p-value	< 0.001†	< 0.001†	
Total			
Preoperative	73.3 (7.1)	74.8 (6.3)	0.342*
12 mths postoperative	92.3 (6.5)	92.5 (5.7)	0.923*
p-value	< 0.001†	< 0.001†	
Mean FFI (SD)			
Preoperative	51.9 (26.5)	53.1 (18.2)	0.814*
12 mths postoperative	9.8 (5.6)	11.1 (15.1)	0.208‡
p-value	< 0.001§	< 0.001§	
Mean VAS (SD)			
Preoperative	5.6 (1.9)	5.5 (1.8)	0.865*
12 mths postoperative	0.7 (0.9)	1.0 (1.4)	0.757‡
p-value	< 0.001§	< 0.001§	
Satisfaction at 12 mths postoperative, n (%)			0.445¶
Very satisfied	9 (23.1)	12 (32.4)	
Satisfied	29 (74.4)	25 (67.6)	
Not satisfied	1 (2.6)	0 (0)	

*Independent-samples *t*-test.
†Paired *t*-test.
‡Mann-Whitney U test.
§Wilcoxon signed-rank test.
¶Fisher's exact test.
ADL, activities of daily living; FAOS, Foot and Ankle Outcome Score; FFI, Foot Function Index; QoL, quality of life; VAS, visual analogue scale.

Table IV. Range of motion (ROM) of the first metatarsophalangeal joint.

ROM	Group A	Group B	p-value
Mean dorsiflexion, ° (SD)			
Preoperatively	36.1 (11.3)	31.5 (10.4)	0.206*
12 mths postoperative	37.2 (9.8)	33.3 (10.2)	0.095†
p-value	0.569‡	0.921§	
Mean plantar flexion, ° (SD)			
Preoperative	39.7 (11.9)	39.8 (10.3)	0.415*
12 mths postoperative	36.7 (14.9)	37.2 (11.4)	0.547*
p-value	0.141§	0.320§	
Mean total ROM, ° (SD)			
Preoperative	75.8 (19.2)	71.3 (19.4)	0.315†
12 mths postoperative	74.0 (22.2)	70.6 (18.7)	0.477†
p-value	0.507‡	0.853‡	

*Mann-Whitney U test.
†Independent-samples *t*-test
‡Paired *t*-test.
§Wilcoxon signed-rank test.

Mean operating times were 59.8 minutes (SD 12.8) in Group A and 56.9 minutes (SD 13.1) in Group B (mean difference 2.9 (95% CI -3.0 to 8.8); p = 0.337, independent-samples *t*-test).

Sub-group analysis. Sub-group analysis according to the severity of deformity is presented in Table V. In the moderate deformity sub-group, there were no significant differences between Groups A and B in the mean HVA and IMA, either preoperatively or postoperatively. However, in the severe deformity sub-group, while no significant differences between the groups were observed preoperatively, both mean postoperative HVA and IMA were significantly lower in Group A than in Group B.

Discussion

In some experimental and clinical studies it has been confirmed that the lateral MSL is the key to successful lateral release in hallux valgus surgery, and that the lateral MSL should be transected completely.[9-11,20-22] In the present study, distal chevron osteotomy for hallux valgus deformity was performed either with (Group A) or without (Group B) release of the lateral MSL. We hypothesized that there would be significant differences in the radiological outcomes between the two groups. We found no significant differences between the two groups in terms of radiological outcomes in moderate deformity, whereas patients with severe deformity demonstrated significantly greater correction of HVA and IMA in Group A compared with Group B.

Controversy still exists regarding the value of distal soft-tissue release for hallux valgus correction. In a comparative study of distal chevron osteotomy with and without lateral soft-tissue release, the changes in the HVA and IMA values, as well as the American Orthopaedic Foot and Ankle Society Hallux Metatarsophalangeal Interphalangeal rating system,[23] were found to be insignificant between the two groups at one year postoperatively.[24] However, as it included only patients with mild-to-moderate hallux valgus deformity, the effectiveness of distal soft-tissue release in patients with severe deformity could not be addressed. A meta-analysis comparing percutaneous hallux valgus surgery with and without lateral soft-tissue release demonstrated that there is no evidence that lateral soft-tissue release reduces the risk of deformity recurrence, or that it improves clinical and radiological outcomes.[25] The authors theorized that the similar recurrence rates in the two groups is due to correct realignment of the first ray's axis, which efficiently neutralizes the valgus-deforming soft-tissue forces, bringing them back to their stabilizing role. The authors acknowledged that one limitation of their study was the provision of level IV evidence, due to the inclusion of studies ranging from levels I to IV. Specifically, among the 17 studies included in their meta-analysis, 12 were classified as level IV evidence. Consequently, pooling of data to directly compare outcomes between the two groups was inappropriate. Thus, radiological

Table V. Sub-group analysis of the outcomes by hallux valgus severity.

Variable	Moderate group			Severe group		
	Group A	Group B	p-value	Group A	Group B	p-value
Patients, n	22	20		17	17	
Mean hallux valgus angle, ° (SD)						
Preoperative	26.8 (6.2)	28.2 (6.1)	0.470*	36.4 (12.3)	41.9 (8.2)	0.130*
12 mths postoperative	9.5 (4.8)	8.7 (5.6)	0.622*	9.9 (6.3)	14.6 (5.3)	0.027*
Mean inter-metatarsal angle, ° (SD)						
Preoperative	11.8 (2.4)	12.5 (2.6)	0.345*	18.4 (2.4)	16.9 (3.0)	0.117*
12 mths postoperative	7.3 (1.9)	7.2 (3.3)	0.924*	8.1 (1.9)	10.3 (3.4)	0.035*
Mean medial sesamoid position grade (SD)						
Preoperative	4.8 (0.9)	5.1 (1.0)	0.205†	6.4 (0.9)	5.7 (0.7)	0.031†
12 mths postoperative	3.1 (0.8)	3.6 (1.0)	0.168†	3.9 (1.4)	3.8 (0.8)	0.838†
Mean FAOS total (SD)						
Preoperative	75.1 (5.7)	75.5 (5.8)	0.587†	71.0 (8.2)	73.9 (7.1)	0.201†
12 mths postoperative	93.7 (4.6)	92.8 (6.6)	0.970†	90.7 (8.2)	92.3 (4.8)	0.782†
Mean FFI (SD)						
Preoperative	55.9 (25.9)	50.8 (16.8)	0.134†	46.8 (27.2)	55.8 (19.9)	0.276*
12 mths postoperative	10.9 (5.8)	14.6 (18.9)	0.606†	8.5 (5.3)	7.0 (7.5)	0.182†
Mean VAS (SD)						
Preoperative	5.2 (1.7)	5.5 (1.9)	0.518†	6.2 (2.2)	5.7 (1.8)	0.454†
12 mths postoperative	0.6 (0.9)	1.1 (1.3)	0.254†	1.0 (1.0)	0.9 (1.7)	0.413†

*Independent-samples *t*-test.
†Mann-Whitney U test.
FAOS, Foot and Ankle Outcome Score; FFI, Foot Function Index; VAS, visual analogue scale.

outcomes such as HVA and IMA were compared by collecting and analyzing mean values from individual studies without pooled meta-analysis. Therefore, this meta-analysis did not provide sufficient evidence to conclude that distal soft-tissue procedures did not affect radiological outcomes such as HVA and IMA. Moreover, since no sub-group analysis based on deformity severity was performed, this meta-analysis did not provide information whether the severity of deformity influenced the effectiveness of distal soft-tissue release. In contrast, an anatomical study by Schneider[9] demonstrated that when different sequential releases were performed, transecting the lateral MSL was the key element to a successful complete reduction of hallux valgus deformity, whereas the transection of other single lateral structures, such as the adductor hallucis and the transmetatarsal ligament, were likely to have less of a corrective effect. Furthermore, the authors of a meta-analysis, in which the outcomes of open chevron osteotomy with and without lateral soft-tissue release were compared, concluded that transecting the MSL could have a beneficial effect in all types of deformities, suggesting the probable efficacy of adductor transection in moderate-to-severe deformity.[26]

Thus, further studies are needed to elucidate the role of distal soft-tissue release in hallux valgus correction, including analyses of potential differences in effectiveness according to deformity severity.

In the present study, the transarticular release technique used in Group A was technically more difficult than that used in Group B. In patients with hallux valgus deformity accompanied by sesamoid rotation, the lateral margin of the lateral sesamoid is situated superior to that of the MTP joint line. This anatomical configuration makes it difficult to approach and release the lateral MSL by using a conventional straight blade.[6] A straight blade inserted through the joint may inadvertently lever against the overlying articular surface of the metatarsal head and lateral sesamoid, which can lead to complications such as intra-articular cartilage injury and flexor hallucis brevis tendon injury.[6] On the other hand, in the transarticular release technique used in Group B, the great toe was distracted distally using two vein retractors and manual traction to clearly visualize the lateral side of the MTP joint. This allowed easier access to the lateral capsular structures with a straight blade than is the case for the technique used in Group A. Thus, although the mean operating time in Group B was shorter by 2.9 minutes compared with Group A, this difference was not statistically significant. This finding suggests that the difference in complexity between the transarticular release techniques used in the two groups was not substantial enough to significantly impact operating time. The clinical relevance of this study is that, for moderate deformities, the simpler transarticular release technique used in Group B may be preferred, whereas for severe deformities, the slightly more technically demanding technique employed in Group A might be necessary.

There are limitations to the present study. First, the surgeons' experience may have influenced the outcomes. All procedures at each institution were performed by the same foot and ankle orthopaedic surgeon. Both of the surgeons were experienced in the two transarticular release techniques; however, the fact that both surgeons were less experienced with the transarticular release technique used in Group A may have affected the results in Group A. Nonetheless, this inherent bias also arises in studies comparing two different techniques performed by a single surgeon, because the surgeon is likely to have greater expertise in one technique compared to the other. Second, the sample size was calculated based on the primary outcome of

HVA, and thus the sub-group analysis should be interpreted with caution, as it may lack sufficient statistical power to draw definitive conclusions.

In conclusion, for moderate hallux valgus deformities, there were no significant differences in radiological outcomes between transarticular distal soft-tissue release with or without lateral MSL release when combined with distal chevron osteotomy. However, in cases of severe deformity, transarticular distal soft-tissue release with lateral MSL release yielded significantly better correction compared with that without lateral MSL release. These findings suggest that lateral MSL release is not indispensable for moderate deformities, but may be beneficial for severe deformities when performing transarticular distal soft-tissue release.

Take home message

- Lateral metatarsosesamoid suspensory ligament (MSL) release does not provide additional benefit in moderate hallux valgus when performing transarticular distal soft-tissue release.
- In severe deformities, adding lateral MSL release enhances correction and may be clinically advantageous.

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Funding statement:

The authors received no financial or material support for the research, authorship, and/or publication of this article.

Data sharing:

The datasets generated and analyzed in the current study are not publicly available due to data protection regulations. Access to data is limited to the researchers who have obtained permission for data processing. Further inquiries can be made to the corresponding author.

Acknowledgements:

The authors thank Mi Seon Song for assistance with patient recruitment and allocation randomization.

Ethical review statement:

The study was approved by the Institutional Review Board of Korea University Hospital (AS16023).

This article was primary edited by M. Hossain.