Comparison of Distal Soft-Tissue Procedures Combined with a Distal Chevron Osteotomy for Moderate to Severe Hallux Valgus: First Web-Space Versus Transarticular Approach

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Background: There are two surgical approaches for distal soft-tissue procedures for the correction of hallux valgus—the dorsal first web-space approach, and the medial transarticular approach. The purpose of this study was to compare the outcomes achieved after use of either of these approaches combined with a distal chevron osteotomy in patients with moderate to severe hallux valgus.

Methods: One hundred and twenty-two female patients (122 feet) who underwent a distal chevron osteotomy as part of a distal soft-tissue procedure for the treatment of symptomatic unilateral moderate to severe hallux valgus constituted the study cohort. The 122 feet were randomly divided into two groups: namely, a dorsal first web-space approach (group D; sixty feet) and a medial transarticular approach (group M; sixty-two feet). The clinical and radiographic results of the two groups were compared at a mean follow-up time of thirty-eight months.

Results: The American Orthopaedic Foot & Ankle Society (AOFAS) hindfoot scale hallux metatarsophalangeal-interphalangeal scores improved from a mean and standard deviation of 55.5 ± 12.8 points preoperatively to 93.5 ± 6.3 points at the final follow-up in group D and from 54.9 ± 12.6 points preoperatively to 93.6 ± 6.2 points at the final follow-up in group M. The mean hallux valgus angle in groups D and M was reduced from 32.2° ± 6.3° and 33.1° ± 8.4° preoperatively to 10.5° ± 5.5° and 9.9° ± 5.5°, respectively, at the time of final follow-up. The mean first intermetatarsal angle in groups D and M was reduced from 15.0° ± 2.8° and 15.3° ± 2.7° preoperatively to 6.5° ± 2.2° and 6.3° ± 2.4°, respectively, at the final follow-up. The clinical and radiographic outcomes were not significantly different between the two groups.

Conclusions: The final clinical and radiographic outcomes between the two approaches for distal soft-tissue procedures were comparable and equally successful. Accordingly, the results of this study suggest that the medial transarticular approach is an effective and reliable means of lateral soft-tissue release compared with the dorsal first web-space approach.

Level of Evidence: Therapeutic Level II. See Instructions for Authors for a complete description of levels of evidence.

Hallux valgus is a foot deformity commonly seen in medical practice, often accompanied by substantial functional disability and foot pain. More than 100 different surgical techniques have been described for correction of hallux valgus. The main purpose of these procedures is to decrease toe pain and correct the deformity. Among these procedures, the combination of an osseous procedure (such as a metatarsal osteotomy) with a distal soft-tissue procedure has shown good overall results and is widely used as the surgical treatment for painful hallux valgus.

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Conclusions

The osseous procedure is aimed at correcting the first-second intermetatarsal angle. The distal soft-tissue procedure is aimed at hallux valgus angle correction and sesamoid reduction. The purpose of the distal soft-tissue procedure is to release the contracted lateral structures, reduce the lateral deforming forces, and reestablish congruity of the first metatarsophalangeal joint. In 1923, Silver described a distal soft-tissue procedure consisting of a medial eminence resection, lateral capsular release, adductor hallucis release, and medial capsular plication with adductor hallucis transposition. Modifications of this procedure, such as medial capsulotomy, division of the ligament between the lateral capsule and the fibular sesamoid, adductor hallucis release, and lateral capsular fenestration, have since been introduced.

There are two surgical approaches for distal soft-tissue procedures for the correction of hallux valgus. One is the dorsal first web-space approach, and the other is the medial transarticular approach. The dorsal first web-space approach allows fairly easy release of the lateral soft tissue and visual assessment. However, it requires an additional incision and leaves a dorsal scar in the first web space. The benefits of the medial transarticular approach are presumed to be decreased morbidity associated with avoidance of an additional incision, improved cosmesis, and a reduced risk of osteonecrosis of the first metatarsal head. However, because patients with hallux valgus have lateral and dorsal displacement of the lateral sesamoid, the release of the lateral soft tissues through a medial incision tends to be incomplete.

We hypothesized that the dorsal web-space approach would produce better results than the medial transarticular approach would. Each method has its own advantages and disadvantages, but there has been little comparative study of the results of the two approaches. Accordingly, the purpose of the present study was to compare the clinical and radiographic results between the two distal soft-tissue procedures when performed in combination with a distal chevron osteotomy for the correction of moderate to severe hallux valgus deformities.

Materials and Methods

This prospective study was approved by the institutional review board of Chonnam National University Hospital, and informed consent was obtained from all patients. Between January 2006 and December 2009, 146 adult female patients (146 feet) underwent a first metatarsal distal chevron osteotomy combined with a distal soft-tissue procedure for the treatment of symptomatic, unilateral, moderate to severe hallux valgus deformity. All procedures were performed by a single surgeon. Indications for this procedure were painful symptomatic unilateral hallux valgus, difficulty in wearing shoes, a preoperative hallux valgus angle ≥20°, a preoperative first-second intermetatarsal angle ≥14°, and an incongruent first metatarsophalangeal joint. All patients had failure of nonoperative treatment consisting of shoe-wear modification and nonsteroidal anti-inflammatory medications. Sixteen patients (sixteen feet) with previous failed hallux valgus surgery, posttraumatic hallux valgus, preexisting radiographic evidence of substantial degenerative arthritis of the first metatarsophalangeal joint, and hallux rigidus or instability at the first metatarsocuneiform joint were excluded.

The remaining 130 patients (130 feet) were divided into two groups, namely, those who were treated with a dorsal first web-space approach (group D), and those who were managed with a medial transarticular approach (group M). Patients were randomized into group D or group M according to their position on the operative registration list (i.e., those whose names were listed next to an even number were treated with a dorsal first web-space approach, and those whose names were listed next to an odd number were managed with a medial transarticular approach). Eight patients (eight feet) without adequate follow-up for at least twenty-four months were excluded. In the end, 122 patients (122 feet) were included and constituted the study cohort. Group D was made up of sixty patients (sixty feet), and group M consisted of sixty-two patients (sixty-two feet) (Fig. 1). Mean patient age at the time of surgery was 46.9 years (range, nineteen to seventy-five years) in group D and 46.7 years (range, nineteen to seventy-five years) in group M, and the mean duration of follow-up was 38.2 months (range, twenty-four to sixty-eight months) in group D and 37.8 months (range, twenty-four to sixty-six months) in group M.

Clinical and radiographic evaluations were performed preoperatively and postoperatively at three, six, and twelve months and then annually thereafter.

Fig. 1
CONSORT (Consolidated Standards of Reporting Trials) flow diagram of this study is shown.
Comparison of the results between the two groups was performed preoperatively and at the final follow-up by two orthopaedic surgeons (Y.-B.P. and S.-K.K.) who were not directly involved in the surgical procedures.

**Surgical Techniques**

The operative technique consisted of a distal soft-tissue procedure and the distal chevron osteotomy. Regional anesthesia was accomplished with use of an ankle block, and exsanguination of the foot and maintenance of hemostasis were accomplished with use of an Esmarch tourniquet around the ankle. The soft-tissue procedure was performed prior to the distal chevron osteotomy.

**Dorsal First Web-Space Approach**

A 3-cm dorsal longitudinal incision was centered on the first intermetatarsal web space. The dissection was made in the midline to protect the branches of the deep peroneal nerve. The adductor hallucis tendon was identified, and the distal end of the adductor tendon that was released from the base of the proximal phalanx of the great toe was dissected from the lateral aspect of the fibular sesamoid. The fibular sesamoid-metatarsal ligament and transverse metatarsal ligament were transected (Fig. 2). The lateral aspect of the first metatarsophalangeal joint capsule was perforated with several puncture wounds, and varus stress of about 20° to 30° was then applied to the first metatarsophalangeal joint so as to complete the release of the lateral soft tissues. By using a standard medial approach to perform the distal chevron osteotomy, a longitudinal midline capsulotomy was able to be performed in the same plane of the incision. After finishing the distal chevron osteotomy, the hallux was then reduced to a neutral position, and the medial side of the joint capsule was closed longitudinally after excising the redundant edges.

**Medial Transarticular Approach**

A medial longitudinal incision was made over the first metatarsophalangeal joint, starting at the midpoint of the proximal phalanx of the great toe and extending 2 cm proximal to the medial eminence. A longitudinal midline capsulotomy was performed in the same plane as that of the incision. The medial eminence was excised about 2 mm medial to the sagittal sulcus with a sagittal saw. To clearly visualize the lateral capsular structures, the first metatarsophalangeal joint was distracted distally with use of two vein retractors and manual traction of the great toe. A curved mosquito forceps was then inserted into the middle portion of the lateral side of the joint capsule and widened metatarsophalangeal joint. After the lateral side of the joint capsule was released with use of a number-15 blade, the adductor hallucis tendon was released completely (Fig. 3). Varus stress was then applied to the first metatarsophalangeal joint in order to complete the release of the adductor hallucis tendon from the proximal phalanx of the great toe. The hallux was reduced to a neutral position after completing the distal chevron osteotomy, and the medial side of the joint capsule was closed longitudinally after excising the redundant edges.

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**Figs. 2-A through 2-D** Anatomical structures to be released through the dorsal first web-space approach. **Fig. 2-A** The adductor hallucis tendon is identified with use of a mosquito forceps. **Fig. 2-B** The adductor hallucis tendon (arrow) has been released from its insertion at the base of proximal phalanx of the great toe. **Fig. 2-C** After releasing the fibular sesamoid-metatarsal ligament, the fibular sesamoid (arrow) can be observed. **Fig. 2-D** The transverse metatarsal ligament (arrow) has been identified and transected.
Distal Chevron Osteotomy
A standard medial incision was made over the first metatarsophalangeal joint starting at the midportion of the proximal phalanx and extending 2 cm proximal to the medial eminence. After making a longitudinal midline capsulotomy, a medial eminence resection and chevron osteotomy were performed with use of standard techniques. We created a 60° V-osteotomy centered in the first metatarsal head, displaced the capital fragment by approximately 5 to 9 mm laterally, and manually impacted the head fragment onto the shaft to obtain a stable reduction. The osteotomy was then fixed with two medially placed Kirschner wires (1.4-mm in diameter). Any remaining proximal medial osseous prominence at the osteotomy site after displacement of the metatarsal head was resected.

Clinical Assessment
An American Orthopaedic Foot & Ankle Society (AOFAS) hallux metatarsophalangeal-interphalangeal score and a patient satisfaction score were obtained preoperatively and at each postoperative follow-up visit in order to measure the clinical parameters: pain (40 points), function (45 points), and alignment (15 points). To evaluate subjective patient satisfaction with the procedure, we asked the patients for their subjective responses. Responses were graded as "very satisfied," "satisfied," "improved," or "dissatisfied." The reliability and validity of this patient satisfaction scale are unknown.

We also evaluated the postoperative complications, including first metatarsophalangeal joint stiffness (defined as range of motion of <30°), osteonecrosis (defined radiographically as the presence of crescent-shaped subchondral lucencies, cysts, osteous collapse, fragmentation, and joint-space narrowing), a short hallux defined as >2.5 mm of metatarsal shortening, delayed union or nonunion (defined as successful healing not occurring within six months), displacement after fixation (defined as movement of the capital fragment from the original site), deep infection (defined as purulent discharge from the wound and abnormal results on blood tests), or first metatarsophalangeal joint arthritis (defined as joint-space narrowing).

Radiographic Assessment
Weight-bearing anteroposterior and lateral radiographs of the foot were made preoperatively and at each postoperative follow-up visit in order to measure the hallux valgus angle, the first-second intermetatarsal angle, tibial sesamoid position, first metatarsal length, and sagittal alignment of the first metatarsal. All radiographic measurements were obtained with use of the Picture Archiving and Communication System (version 5.4; Marotech, Seoul, Republic of Korea). The hallux valgus angle was defined as the angle formed by the intersection of the diaphyseal axis of the proximal phalanx of the great toe and the longitudinal axis of the first metatarsal, which was determined by connecting the center of the first metatarsal and the center of the proximal articular surface. The first-second intermetatarsal angle was obtained by determining the angle formed by a line bisecting the second metatarsal shaft and a line drawn between the center of the first metatarsal head and the center of the proximal articular surface. The sesamoid position was defined by the position of the medial sesamoid in relation to a longitudinal line bisecting the first metatarsal shaft and classified as grade 0, 1, 2, or 3. First metatarsal length was measured with use of the Hardy and Clapham method, and the alignment of the head of the first metatarsal in the sagittal plane in relation to the shaft of the first metatarsal was defined as having neutral, dorsal, or plantar angulation.

Statistical Methods
In the absence of an established minimal clinically important difference for the primary outcome measure (the AOFAS score), no formal power analysis (two-sided, \( p = 0.05 \)) was performed. We tested the null hypothesis that the mean...
AOFAS score of group D would be better than that of group M (i.e., a type-II error). A sample-size calculation determined that forty-seven patients were needed per group to ensure 90% power based on a 10-point (standard deviation, 15 points) minimal clinically important difference between groups. A total of 130 patients were recruited to allow for loss to follow-up. Additionally, a post hoc power analysis demonstrated that the sample size was sufficiently powered to compare outcomes of AOFAS score, hallux valgus angle, first-second intermetatarsal angle, tibial sesamoid position, and complication rates at the time of final follow-up.

The independent t test was used to determine the significance of intergroup differences in age and follow-up duration. The Mann-Whitney U test was used to determine the significance of intergroup differences in AOFAS score, hallux valgus angle, first-second intermetatarsal angle, and tibial sesamoid position.

### TABLE I Clinical Outcomes of the Two Distal Soft-Tissue Procedures*

<table>
<thead>
<tr>
<th></th>
<th>Dorsal First Web-Space Approach</th>
<th>Medial Transarticular Approach</th>
<th>P Value†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative AOFAS score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>55.5 ± 12.8</td>
<td>54.9 ± 12.6</td>
<td>0.805</td>
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<tr>
<td>Pain</td>
<td>22.4 ± 5.4</td>
<td>22.3 ± 6.5</td>
<td>0.784</td>
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<tr>
<td>Function</td>
<td>31.6 ± 6.4</td>
<td>30.9 ± 5.2</td>
<td>0.315</td>
</tr>
<tr>
<td>Alignment</td>
<td>1.5 ± 3.1</td>
<td>1.7 ± 3.3</td>
<td>0.460</td>
</tr>
<tr>
<td>Final follow-up AOFAS score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>93.5 ± 6.3</td>
<td>93.6 ± 6.2</td>
<td>0.635</td>
</tr>
<tr>
<td>Pain</td>
<td>38.2 ± 3.9</td>
<td>37.7 ± 4.3</td>
<td>0.566</td>
</tr>
<tr>
<td>Function</td>
<td>40.7 ± 3.9</td>
<td>41.6 ± 3.6</td>
<td>0.740</td>
</tr>
<tr>
<td>Alignment</td>
<td>14.6 ± 1.6</td>
<td>14.3 ± 2.1</td>
<td>0.497</td>
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<tr>
<td>P value‡</td>
<td>0.000</td>
<td>0.000</td>
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</table>

*Values are expressed as the mean and the standard deviation. †Mann-Whitney U test. The p values shown are for intergroup comparisons. A p value of <0.05 was considered significant. ‡Paired t test. The p values pertain to the comparisons between the preoperative American Orthopaedic Foot & Ankle Society (AOFAS) total score and the AOFAS total score at the time of the final follow-up. A p value of <0.05 was considered significant.

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**Figs. 4-A and 4-B** Radiographic measurements of the hallux valgus angle (α) and the first-second intermetatarsal angle (β) preoperatively (Fig. 4-A) and postoperatively (Fig. 4-B).
TABLE II Radiographic Outcomes of the Two Distal Soft-Tissue Procedures*

<table>
<thead>
<tr>
<th></th>
<th>Dorsal First Web Space</th>
<th>Medial Transarticular</th>
<th>P Value†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hallux valgus angle (deg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preoperative</td>
<td>32.2 ± 6.3</td>
<td>33.1 ± 8.4</td>
<td>0.348</td>
</tr>
<tr>
<td>Final follow-up</td>
<td>10.5 ± 5.5</td>
<td>9.9 ± 5.5</td>
<td>0.640</td>
</tr>
<tr>
<td>P value‡</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Intermetatarsal angle (deg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preoperative</td>
<td>15.0 ± 2.8</td>
<td>15.3 ± 2.7</td>
<td>0.806</td>
</tr>
<tr>
<td>Final follow-up</td>
<td>6.5 ± 2.2</td>
<td>6.3 ± 2.4</td>
<td>0.790</td>
</tr>
<tr>
<td>P value‡</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Tibial sesamoid position (grade 0 to 3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preoperative</td>
<td>2.3 ± 0.7</td>
<td>2.6 ± 0.5</td>
<td>0.139</td>
</tr>
<tr>
<td>Final follow-up</td>
<td>1.3 ± 0.6</td>
<td>1.4 ± 0.5</td>
<td>0.453</td>
</tr>
<tr>
<td>P value‡</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
</tr>
</tbody>
</table>

*Values are expressed as the mean and the standard deviation. †Mann-Whitney U test. The p values shown are for intergroup comparisons. A p value of <0.05 was considered significant. ‡Paired t test. The p values pertain to the comparisons between the preoperative and final follow-up examinations. A p value of <0.05 was considered significant.

Results

Preoperative and postoperative AOFAS scores for both groups are shown in Table I. The AOFAS scores between group D and group M at the final follow-up were not significantly different (p = 0.635).

At the final follow-up, the results of the survey of patient satisfaction revealed good results (“satisfied” and “very satisfied”) in fifty-eight (96.7%) of sixty patients in group D (see Fig. E-1 in the Appendix) and in sixty (96.8%) of sixty-two patients in group M (see Fig. E-2 in the Appendix). Patient satisfaction was as follows: in group D, twenty-five patients (41.7%) were “very satisfied,” thirty-three patients (55.0%) were “satisfied,” and two patients (3.3%) were “improved”; in group M, twenty-eight patients (45.2%) were “very satisfied,” thirty-two patients (51.6%) were “satisfied,” and two patients (3.2%) were “improved.” Patient satisfaction was not significantly different between the two groups with use of the Fisher exact test (p = 0.993).

Of the two patients in group D who showed an “improved” response, one patient had symptomatic thickening in the dorsal first web-space scar and the other patient had persistent bunion pain; of the two patients in group M who showed an “improved” response, one patient had symptomatic first metatarsophalangeal joint stiffness and the other patient had persistent bunion pain. All four patients refused additional surgery. No patient marked “dissatisfied” on the questionnaire.

Preoperative and postoperative radiographic results for both groups are shown in Table II. There were significant improvements in the hallux valgus angle and the first-second intermetatarsal angle at the time of final follow-up in each group (p < 0.05). Also, no significant intergroup difference was observed in the hallux valgus angle (p = 0.64) or the intermetatarsal angle (p = 0.79) at the final follow-up.

The tibial sesamoid position showed significant improvement at the final follow-up compared with the preoperative position in each group (p < 0.05). The tibial sesamoid position showed no significant difference between groups at the time of final follow-up (p = 0.453). Mean first metatarsal shortening was 2.3 ± 1.2 mm (range, 0 to 4 mm) in group D and 2.2 ± 1.6 mm (range, 0 to 3.4 mm) in group M at the time of final follow-up. However, no patient complained of having a short hallux. At the time of final follow-up in group D, a neutral position of the first metatarsal head in the sagittal plane was observed in fifty-five (91.7%) of the sixty feet, dorsal angulation of the first metatarsal head was observed in two feet (3.3%), and plantar flexion of the first metatarsal head was observed in three feet (5.0%). At the time of final follow-up in group M, a neutral position of the first metatarsal head was observed in fifty-eight (93.5%) of the sixty-two feet, dorsal angulation of the first metatarsal head was observed in two feet (3.2%), and plantar flexion of the first metatarsal head was observed in two feet (3.2%). No patient complained of a dorsal or plantar angulation.

A total of eleven complications occurred in both groups (six in group D and five in group M). In group D, complications included first metatarsophalangeal joint stiffness in two patients, numbness along the medial side of the great toe in one patient, superficial wound infection in one patient, persistent bunion pain in one patient, and thickening of the dorsal first web-space scar in one patient. In group M, complications included...
first metatarsophalangeal joint stiffness in one patient, numbness along the medial side of the great toe in two patients, superficial wound infection in one patient, and persistent bunion pain in one patient. In both groups, there were no cases of recurrence, osteonecrosis, nonunion or malunion, displacement after fixation, deep infection, or first metatarsophalangeal joint arthritis at the time of final follow-up. Complication rates in group D and group M were 10% and 8.1%, respectively. There was no significant difference in terms of postoperative complication rates between the two groups (p = 0.71).

Discussion

The anatomy about the first metatarsophalangeal joint and its importance in the development of hallux valgus have been well described. Soft-tissue imbalance combined with the lack of an antagonistic force on the medial side and overpull of the adductor conjoined tendon on the base of the proximal phalanx plays an important role in the pathophysiology of hallux valgus. Failure to correct this pathomechanism has been considered to be one of the causes of inadequate correction of the hallux valgus angle. Therefore, the distal soft-tissue procedures are aimed at hallux valgus angle correction and sesamoid reduction mainly by releasing the contracted lateral structures in order to decrease the lateral deforming forces and realign the first metatarsophalangeal joint.

Since lateral soft-tissue release through a dorsal first web-space approach has been established as an important adjunct for the correction of hallux valgus, modified methods of exposure and release have been described, particularly the medial transarticular release approach through a single medial incision at the metatarsophalangeal joint. The dorsal first web-space approach is more widely used by foot surgeons; however, complications can occur with use of this approach, including osteonecrosis of the first metatarsal head when this procedure is performed in combination with a distal metatarsal osteotomy, thickness of the incision scar, contracture of the soft tissue released from the dorsal first web space, and decreased cosmesis due to dorsal first web-space scarring. While the medial transarticular release method has the benefits of decreased morbidity associated with the avoidance of an additional incision, improved cosmesis due to less scarring in the dorsal first web space, and a reduced risk of osteonecrosis of the first metatarsal head, it is associated with complications such as intra-articular cartilage injury and flexor hallucis brevis tendon injury. There is also the possibility of performing an inadequate lateral soft-tissue release because of less clear visualization. In this series, we did not experience any instance of intra-articular cartilage injury or flexor hallucis brevis tendon injury intraoperatively in group M, and we believe that these injuries can be avoided by using two vein retractors and a curved mosquito forceps to guide the number-15 blade during the release. Brand and Smith described the intra-articular adductor release technique in conjunction with the metatarsal chevron osteotomy, and they stated that this combination facilitated the correction of hallux valgus while minimizing the recurrence. Chen et al. reported on the use of a distal chevron osteotomy and an intra-articular lateral soft-tissue procedure for the treatment of moderate to severe hallux valgus. They concluded that this combination provides an effective means of correcting hallux valgus with a high level of patient satisfaction and a low incidence of osteonecrosis, even in patients with severe hallux valgus. Moreover, Waldecker compared the outcomes of the two approaches and both demonstrated equally good clinical and radiographic results.

In the present study, the clinical and radiographic outcomes associated with the two distal soft-tissue procedures were comparable at the time of final follow-up. On the basis of our results, we believe that a medial transarticular approach is adequate for the correction of hallux valgus. However, caution should be exercised intraoperatively so as to avoid over-release of the lateral side of the joint capsule since, with this technique, the entire capsule has to be incised instead of perforated several times as in the dorsal first web-space approach.

Osteonecrosis of the metatarsal head is a well-documented complication associated with extensive distal soft-tissue release procedures. An anatomical study of the blood supply to the first metatarsal head has suggested that the first dorsal metatarsal artery is the primary source, and this blood supply should be meticulously preserved. In this respect, theoretically, a benefit of the medial transarticular approach, as compared with the dorsal first web-space approach, is a reduced risk of osteonecrosis of the first metatarsal head. In this study, however, there was no occurrence of osteonecrosis in either group D or group M.

There are some limitations to this study. First, the follow-up period was relatively short. Second, we used a subjective scale to evaluate patient satisfaction and the cosmetic result of the procedure, and this scale may not be valid and reliable.

In conclusion, the clinical and radiographic outcomes of the two distal soft-tissue procedures combined with distal chevron osteotomy for hallux valgus correction were comparable and successful. The results of this study suggest that the medial transarticular approach is an effective and reliable means of lateral soft-tissue release when compared with the dorsal first web-space approach.

Appendix

Figures showing preoperative and postoperative clinical photographs and radiographs of feet that were treated with a distal chevron osteotomy and a distal soft-tissue release through either a dorsal first web-space approach or a medial transarticular approach are available with the online version of this article as a data supplement at jbjs.org.

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