ORIGINAL ARTICLE

The relationship between changes in distal tibiofibular joint congruence and clinical and functional results in the short-term follow-up of patients operated on for ankle fracture

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ABSTRACT

BACKGROUND: The effects of changes in distal tibiofibular joint (DTFJ) congruence on clinical and functional outcomes are unclear in patients operated on for ankle fractures. The present study aims to evaluate the relationship between changes in DTFJ congruence and clinical and functional outcomes in the short-term follow-up of the patients operated on for ankle fractures.

METHODS: In this study, hospital records of patients who were operated on for ankle fractures were retrospectively analyzed. The data of patients who underwent bilateral ankle computed tomography scans at least 18 months after surgery were used. DTFJ congruence was evaluated using four methods. Method 1: the distance between the most prominent anterior points of the tibia and fibula (anterior incisura [AI]) and that between the most prominent posterior points of the tibia and fibula (posterior incisura [PI]) were measured. Method 2: the direct anterior (DA) and direct posterior (DP) distances were measured based on perpendicular lines drawn from the most prominent anterior and posterior points of the longitudinal axis of the fibula to the tibia, respectively, and a direct translation (DT) distance was measured based on a perpendicular line drawn to the DA from the most prominent anterior point of the tibia. Method 3: the angle between a line connecting the most anterior and posterior points of the tibia and a line connecting the most anterior and posterior points of the fibula (rotational angle [RA]) was measured. The differences in distances and angles (dAI, dPI, dDA, dDP, dDT, and dRA) between the injured and non-injured sides were calculated in the first three methods. Method 4: any rotational/translational incongruency on the injured side was subjectively reported. The American Orthopedic Foot and Ankle Society (AOFAS) ankle-hindfoot scale, Olerud–Molander Ankle Score (OMAS), and Visual Analog Scale (VAS) were used for clinical and functional evaluations.

RESULTS: Thirty patients (18 males and 12 females; mean age, 43.3 [range, 20–78 years] years) were included in this study. The average follow-up was 37.6 (range, 18–54 months) months. Negative correlations were detected between dDA and the AOFAS-pain subscale ($r=-0.37$; $p=0.04$), between dDP and the OMAS ($r=-0.57$; $p=0.01$), and between dDT and the AOFAS-pain, AOFAS-function, and OMAS ($r=-0.55$ $p=0.01$; $r=-0.40$; $p=0.03$; $r=-0.39$; $p=0.04$, respectively).

CONCLUSION: Changes in dDA, dDP, and dDT values affect the clinical and functional outcomes. These parameters should be provided in accordance with the anatomy of the patient during the reduction of the DTFJ to achieve better outcomes.

Keywords: Ankle fractures; CT; syndesmosis.

INTRODUCTION

Ankle fractures are among the fractures that are most frequently treated by orthopedic surgeons and most in need of operative treatment.[1,2] Although some authors have reported negative results in cases of distal tibiofibular joint (DTFJ) malreduction,[3–5] other authors have reported that some minor differences do not affect the clinical outcome.[6]

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Ankle fractures have traditionally been evaluated using plain radiographs. However, plain radiographs are not reliable enough for determining congruence in the DTFJ.[7] Computed tomography (CT) is more reliable and precise than plain radiography.[7] By contrast, variability in the normal anatomy of the fibular incisura makes it challenging to evaluate the DTFJ on a CT scan.[8] Therefore, obtaining data from the normal side of the patient is advantageous for evaluating individual differences among patients.

The relationship between functional results and DTFJ malreduction as detected using bilateral, early, or late postoperative CT scans has been evaluated in only few studies.[3–6,9]

Our study aimed to evaluate the relationship between clinical and functional outcomes and changes in DTFJ congruence measured using bilateral ankle CT scans of surgically treated ankle fractures. Our hypothesis was that DTFJ incongruence negatively affects clinical and functional outcomes.

MATERIALS AND METHODS

After obtaining institutional review board approval, patients who were operated on for an ankle fracture between January 2014 and December 2016 were included in this study. The hospital records of 241 patients were retrospectively analyzed. The inclusion criteria were ankle fracture, completed skeletal maturity, and bilateral (injured and uninjured) ankle CT scans within the last three months and at least 18 months after surgery. The exclusion criteria were pilon fractures, pathological fractures, multiple fractures, previous fractures, and previous ankle arthrosis. Detailed information on the inclusion and exclusion criteria is given in Table 1.

The Lauge–Hansen and Danis–Weber classifications were used to evaluate the fractures. Characteristics of fixation during the operation were noted. Postoperative follow-up and rehabilitation stages were recorded. The minimum follow-up duration was scheduled for 18 months.

Fixation characteristics were evaluated using postoperative plain radiographs and CT scans. CT was performed using the Optima CT660 scanner (General Electric, Milwaukee, WI, USA) with a 0.625-mm slice thickness. DTFJ congruence was evaluated using axial CT scans taken at 1 cm proximal to the plafond. Congruence was determined by the second author using four different methods as follows. Method 1: the distance between the most prominent anterior points of the tibia and fibula (anterior incisura [AI]) and the distance between the most prominent posterior points of the tibia and fibula (posterior incisura [PI]) were measured (Fig. 1).[6] This method was used to assess isolated anterior or posterior ligamentous injury. Method 2: the direct anterior (DA) and direct posterior (DP) distances were measured based on perpendicular lines drawn from the most prominent anterior and posterior points of the longitudinal axis of the fibula to the tibia, respectively. The direct translation (DT) distance, which was measured based on a perpendicular line drawn to the DA from the most prominent anterior point of the tibia (Fig. 2), was also measured.[6] Method 2 was used to assess anteroposterior and lateral translation of the fibula. Method 3: the angle between a line connecting the most anterior and posterior points of the tibia and a line connecting the most anterior and posterior points of the fibula (rotational angle [RA]) was measured (Fig. 3).[6] The RA represents the rotation of the fibula; positive angles represent internal rotation, whereas negative angles represent external rotation. For

Table 1. Inclusion or exclusion criteria in this study

Criteria	Reason
Inclusion	
1- All types of malleolar fractures indicated for surgical treatment (with or without syndesmotic injuries)	All of these fractures may lead to changes in DTFJ congruence.
2- Completed skeletal maturity	To obtain a homogeneous group of patients who have completed skeletal maturation.
3- Bilateral (injured and uninjured) ankle CT scans in the last three months and at least 18 months after surgery.	To eliminate personal differences and create a control group, to assess clinical and functional outcomes while minimizing variation in the DTFJ data after the CT scan, and to obtain short-term follow-up results.
Exclusion	
1- Pilon fractures	
2- Pathological fractures	
3- Multiple fractures	Could further affect clinical and functional outcomes.
4- Previous ankle fractures	
5- Previous ankle arthrosis	

CT: Computed tomography; DTFJ: Distal tibiofibular joint.

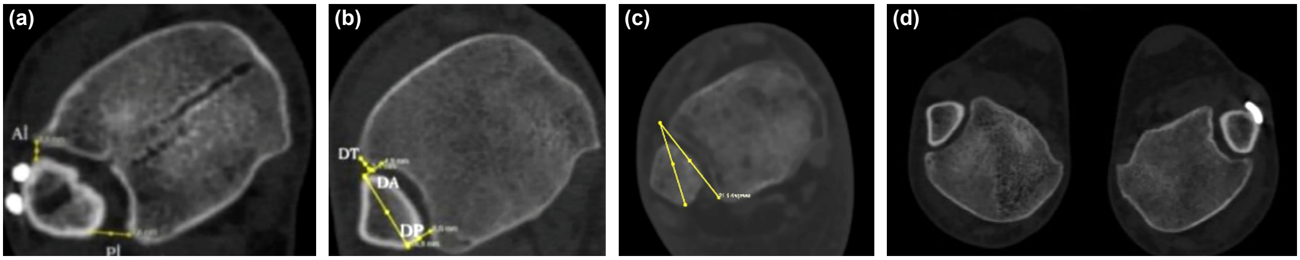

Figure 1. **(a)** In Method 1, the distance between the most prominent anterior points of the tibia and fibula (anterior incisura [AI]) and the distance between the most prominent posterior points of the tibia and fibula (posterior incisura [PI]) within the distal tibiofibular joint (DTFJ) as visualized on an axial computed tomography (CT) scan were measured. Differences in the distances (dAI and dPI) between the injured and uninjured sides were analyzed. **(b)** In Method 2, the direct anterior (DA) and direct posterior (DP) distances, based on perpendicular lines drawn from the most prominent anterior and posterior points of the longitudinal axis of the fibula to the tibia, and the direct translation (DT) distance, based on a perpendicular line drawn from the DA point to the most prominent anterior point of the tibia within the DTFJ, were measured from an axial CT scan. Differences in the distances (dDA, dDP, and dDT) between the injured and uninjured sides were analyzed. **(c)** In Method 3, the angle between a line connecting the most anterior and posterior points of the tibia and a line connecting the most anterior and posterior points of the fibula (rotational angle [RA]) was measured on an axial CT scan of the DTFJ. Differences in the angles (dRA) between injured and uninjured sides were analyzed. **(d)** In Method 4, DTFJ reduction was assessed macroscopically using axial CT scans. Any rotational or translational incongruency on the injured side than the non-injured side was subjectively reported.

these three methods, the differences in distances and angles (dAI, dPI, dDA, dDP, dDT, and dRA) between the injured and non-injured sides were calculated. Method 4: any rotational or translational incongruence on the injured side than the non-injured side was subjectively reported (Fig. 4)[6] as congruence or incongruence. The American Orthopedic Foot and Ankle Society (AOFAS) ankle-hindfoot scale,[10] Olerud–Molander Ankle Score (OMAS)[11] and Visual Analog Scale (VAS)[12] were used for clinical and functional evaluation at the last follow-up visit. The AOFAS ankle-hindfoot scale is a scoring system, which has pain, function, and alignment subscales. The total number of points equals 100. A high score indicates a good result. The OMAS is an ankle-specific functional scoring system in which the sum of the points equals 100, and a high score indicates a good result. The VAS is a scale used to convert non-numerical values (such as pain intensity that cannot be measured numerically) to numerical values. One end of a double-ended 100-mm long line indicates no pain, and the other end of the line indicates the most severe pain. Each patient was asked to indicate their current degree of pain on the line. A high score predicts a poor outcome.

Statistical Analysis

Statistical analysis was performed using SPSS 24.0 software (SPSS Inc., Chicago, IL, USA). A p-value <0.05 was considered to denote significance. The value of the non-injured side was subtracted from the operated side. Pearson's correlation analysis was used to identify the relationships between differences in measurements and the AOFAS ankle-hindfoot scale, OMAS and VAS scores.

RESULTS

Thirty patients (18 males and 12 females; mean age, 43.3 [range, 20-78 years] years) met the inclusion criteria. The average follow-up was 37.6 (range, 18–54) months.

The mechanism of injury was ankle distortion in 17 patients (56.7%), a traffic accident in five patients (16.7%), a fall from a height in three patients (10%), and other injuries in five patients (16.7%). According to the Lauge–Hansen classification, 19 patients had a supination-external rotation injury, seven patients had a pronation-external rotation injury, one patient had supination-adduction, and three patients had a pronation-abduction injury. According to the Danis–Weber classification, one patient had type A (infrasyndesmotic), 20 had type B (syndesmotic) and seven had type C (suprasyndesmotic) lateral malleolus fractures. Two patients who did not have lateral malleolus fractures were not included in this classification.

Of the 30 patients, 10 had unimalleolar (two medial malleoli and eight lateral malleolus) fractures, eight had bimalleolar (five medial + lateral malleoli, three lateral + posterior malleoli) fractures, and 12 had trimalleolar fractures.

The lateral malleolus was fixed using plate osteosynthesis in 25 patients, a screw in one patient, and a rush pin in one patient. The medial malleolus was fixed using a malleolus screw in 12 patients and the tension-band method in six patients. The posterior malleolus was fixed using a malleolus screw in five patients. Seventeen patients had a syndesmotic injury and were treated with three-cortex (3.5 mm) cortical syndesmotic screws. One lateral malleolus fracture and one medial malleolus fracture were treated nonoperatively. Four patients had an accompanying deltoid ligament rupture.

Of the 30 patients, 28 received a short leg splint during the postoperative period. The mean duration of splint use was 40.6 (range, 17–60) days. Active ankle exercises were recommended immediately for two patients and after removal of the splint for the others. Partial weight bearing was recommended six weeks after the operation, and weight bear-

Table 2. Measurements obtained using methods 1–3 of the operated and unoperated sides

Side	Method 1		Method 2			Method 3
	AI	PI	DA	DP	DT	RA
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
Operated ankle	5.98±2.01	9.10±2.42	7.59±3.13	9.73±2.56	2.34±1.77	8.6°±8.87°
	(3.4–12)	(5.2–17.5)	(4.5–19.1)	(6.00–17.20)	(−2.6–4.9)	(−12.5°–24.3°)
Uninjured ankle	4.73±1.18	8.99±1.9	5.98±1.15	9.13±1.64	2.92±0.88	13.01°±8.06°
	(3.3–9.1)	(6.0–13.5)	(3.9–9.4)	(6.40–12.70)	(1–4.2)	(−11.5°–25.5°)

AI: Anterior incisura (mm); PI: Posterior incisura (mm); DA: Direct anterior (mm); DP: Direct posterior (mm); DT: Direct translation (mm); RA: Rotation angle; SD: Standard deviation.

Table 3. Correlations between the differences in the measurements obtained using methods 1–3 and the AOFAS-pain, AOFAS-function, AOFAS-alignment, OMAS, and VAS scores

	AOFAS pain	AOFAS function	OMAS	VAS
Method 1				
dAI				
r	0.01	0.04	0.04	−0.14
p	0.97	0.83	0.82	0.45
dPI				
r	−0.28	−0.16	−0.35	0.09
p	0.14	0.48	0.05	0.64
Method 2				
dDA				
r	−0.37	−0.18	−0.29	0.12
p	0.04*	0.36	0.12	0.52
dDP				
r	−0.26	−0.32	−0.57	0.09
p	0.17	0.09	0.01*	0.64
dDT				
r	−0.55	−0.40	−0.39	0.32
p	0.01*	0.03*	0.04*	0.09
Method 3				
dRA				
r	−0.10	−0.17	−0.21	0.02
p	0.61	0.37	0.28	0.94

AOFAS: American Orthopedic Foot and Ankle Society-Ankle Scale. As the AOFAS alignment subscale scores were the same in all cases, they were not included in the statistical analysis. OMAS: Olerud–Molander Ankle Score; VAS: Visual Analog Scale. dAI: Difference in the anterior incisura value between the operated and uninjured sides. dPI: Difference in the posterior incisura value between the operated and uninjured sides. dDA: Difference in the direct anterior value between the operated and uninjured sides. dDP: Difference in the direct posterior value between the operated and uninjured sides. dDT: Difference in the direct translation value between the operated and uninjured sides. dRA: Difference in the rotational angle between the operated and uninjured sides. *P<0.05; r: Pearson's correlation coefficient.

Table 4. Relationships between DTFJ reduction quality and AOFAS-pain, AOFAS-function, OMAS, and VAS scores assigned based on Method 4

	Incongruence (n=11)	Anatomic congruence (n=19)	p
AOFAS pain	30±12.65	33.68±7.61	0.33
AOFAS function	46.73±4.80	47.84±2.99	0.50
OMAS	80±23.56	85.26±19.33	0.51
VAS	19.09±21.07	20.79±29.36	0.87

DTFJ: Distal tibiofibular joint; AOFAS: American Orthopedic Foot and Ankle Society. As the AOFAS alignment subscale scores were the same in all cases, they were not included in the statistical analysis. OMAS: Olerud–Molander Ankle Score; VAS: Visual Analog Scale.

ing was increased gradually. All syndesmotic screws were removed at a mean of 3.4 (range, 1.3–11.5) months after the primary surgery.

The uninjured and injured sides were compared using data collected via methods 1–3 (Table 2). According to Method 4, DTFJ congruence could not be achieved in 11 patients (36.7%), whereas anatomic congruence was observed in 19 patients (63.3%).

The relationships between the measurements collected using methods 1, 2, and 3 and clinical scores are shown in Table 3. A negative correlation was detected between dDA and the AOFAS-pain subscale (r=−0.37, p=0.04). Additionally, a negative correlation was observed between dDP and the OMAS (r=−0.57, p=0.01). A negative correlation was also found between dDT and the AOFAS-pain, AOFAS-function, and OMAS (r=−0.55, p=0.01; r=−0.40, p=0.03; r=−0.39, p=0.04; respectively).

The relationships between DTFJ congruence and AOFAS-pain, AOFAS-function, AOFAS-alignment, OMAS, and VAS scores (Method 4) are shown in Table 4. No differences were detected in the clinical scores between the patients with and without anatomical congruence (p>0.05).

DISCUSSION

High rates of DTFJ malreduction have been reported after operative treatment of ankle fractures with the help of new imaging and evaluation methods.[3,9,13,14] However, the clinical importance of DTFJ congruence in ankle fractures remains unclear. Postoperative bilateral CT was performed to compare the measurements taken from the operated side with those taken from the uninjured side, which was helpful to better understand the complexity of the ankle fracture.[15]

Patients who underwent an operation for ankle fractures and bilateral postoperative CT were investigated in this study. Of the distances measured in the CT scans, DA and DP distances, which were based on the lengths of perpendicular lines from anterior and posterior points of the longitudinal axis of the fibula, respectively, to its longitudinal axis, and the DT distance, which was based on the perpendicular distance between the DA point and the most prominent anterior point of the tibia (Method 2; Fig. 2), affected clinical and functional outcomes.

Few studies have evaluated the relationship between the clinical results obtained after surgical treatment of an ankle fracture and DTFJ reduction quality as detected using postoperative bilateral ankle CT scans. Kocadal et al.[9] used a syndesmotic screw or suture button to fix syndesmosis in 52 patients with ankle fractures, who then attended follow-up with a mean period of 16.7 months. They evaluated the relationship between reduction quality and clinical outcomes that were assessed using early postoperative CT scans using four parameters (anteroposterior reduction, rotational reduction, cross-sectional syndesmotic area, and distal tibiofibular volume). Although they reported some changes in the reduction of the fibula, these changes did not significantly affect clinical outcomes. Similarly, Warner et al.[6] investigated 155 patients using bilateral early postoperative CT scans based on the four parameters that we used in the current study. They reported displacements of 1.32–1.88 mm and a rotation of 5.75° compared with the uninjured side and concluded that this minor syndesmotic malreduction did not affect clinical outcomes after a minimum 1-year follow-up. They also noted that larger displacements could affect outcomes. Sagi et al.[3] investigated the relationship between DTFJ congruence and clinical outcomes after a 24-month follow-up. They evaluated malreduction in three categories: lateralization, rotation, and anteroposterior translation. The results revealed that 39.7% of the patients exhibited malreduction (rotational or translational) that was related to worse Short Form Musculoskeletal Assessment and OMAS. In a study in which two syndesmotic fixations (suture button and screw) methods were compared after a minimum patient follow-up of 18 months, Naqvi et al.[4] reported the outcomes for 46 patients. They measured the anterior, middle, and posterior widths of the syndesmoses using bilateral axial CT scans. A displacement of ≥2 mm (relative to the normal side) was the malreduction criterion. In that study, clinical outcomes were assessed using the Foot and Ankle Disability Index and AOFAS ankle-hindfoot scales. Approximately 22% of the patients in the screw-fixation group exhibited malreduction, whereas no malreduction was observed in the suture-button group. However, clinical outcomes did not differ significantly between groups. However, a regression analysis revealed that malreduction, which occurred independently of the fixation technique, negatively affected the clinical outcome.

Andersen et al.[5] treated syndesmotic injuries with suture buttons or four-cortex cortical screws. After a mean of 85.9 days, they removed the screws and assessed the outcomes after a follow-up of at least two years. They reported that eight of 40 patients in the suture-button group and 20 of 40 patients in the syndesmotic-screw group exhibited syndesmotic widening of more than 2 mm. They also found that patients with no syndesmotic widening reported better AOFAS and OMAS but lower VAS scores during walking and at rest.

After surgical treatment of ankle fractures, many authors have reported that a DTFJ reduction may change over time.[3–6,9,16] This case is more likely seen in patients who had been treated using a syndesmotic screw.[4,5] Determining the relationship between radiological parameters measured from bilateral ankle CT during the early postoperative period and clinical outcomes measured late in follow-up is not a suitable method, as the DTFJ may have undergone changes that would affect the clinical outcome. Thus, the outcomes reported by Kocadal et al.[9] and Warner et al.[6] may be misleading from this point of view. Therefore, to investigate the relationship between anatomical changes in the DTFJ and late clinical outcomes, we evaluated patients who underwent bilateral ankle CT at a minimum follow-up period of 18 months postoperatively. We shortened the interval between the last analysis of the DTFJ position and the time that the clinical examination was made. This interval was a maximum of three months in the current study. Three months was reasonable considering that syndesmotic widening occurs mostly during the early period after removing the syndesmotic screw.

No standardized evaluation method is available to assess the DTFJ using CT scans. However, we evaluated DTFJ congruence using axial CT scans based on four parameters that provided detailed information in a study conducted by Warner et al.[6] An evaluation using these four parameters is superior to other methods.[3–5]

In this study, no significant correlation was detected between clinical outcomes and dAI (represents isolated anterior ligament injury), dPI (represents isolated posterior ligament injury), or dRA values (represents fibular rotation), or a subjective assessment of congruence (reduction or malreduction). These results were consistent with those of Warner et al.[6] and Kocadal et al.[9] However, the authors of those studies investigated the relationship between early CT parameters and late clinical outcomes. By contrast, we obtained results that differed from those of studies that evaluated the relationship between clinical and functional outcomes and late follow-up CT scans.[3–5] In this study, we found a negative correlation between clinical and functional outcomes and some Method-2 radiological measurements–e.g., dDA and the AOFAS-pain subscale score (p=0.04), dDP and the OMAS (p=0.01), dDT and the AOFAS-pain subscale score (p=0.01), dDT and the AOFAS-function subscale score (p=0.03), and dDT and the OMAS (p=0.04). Our results may differ from those of Warner et al.[6] because of differences in the time when CT scans were performed, parameters, the patient population, and follow-up duration. However, we think that the Method-2 parameters, which are related to lateral and/or anteroposterior translation of the fibula should be considered when the DTFJ is reduced during the treatment for an ankle fracture, and better clinical outcomes will be achieved if these parameters are consistent with those associated with normal anatomy.

The major limitation of our study was that we evaluated DTFJ congruence in different types of ankle fractures, which prevented standardization of the results and made it challenging to achieve strong conclusions. Other limitations of our study were its retrospective design and the small number of patients. It may be possible to achieve more accurate results with prospectively designed studies using a larger number of standardized patients.

Conclusion

Changes in dDA, dDP, and dDT values affect the clinical and functional outcomes. These parameters should be provided in accordance with the anatomy of the patient during the reduction of the DTFJ to achieve better outcomes.

Ethics Committee Approval: This study approved by the Medeniyet University Göztepe Training and Research Hospital Clinical Research Ethics Committee (Date: 12.06.2018, Decision No: 2018/0201).

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ORİJİNAL ÇALIŞMA - *ÖZ*

Ayak bileği kırığı nedeniyle ameliyat edilen hastaların kısa dönem takiplerinde distal tibiofibular eklem uyumunda meydana gelen değişiklikler ile klinik ve fonksiyonel sonuçlar arasındaki ilişki

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AMAÇ: Ayak bileği kırığı nedeniyle ameliyat edilen hastalarda distal tibiofibular eklem (DTFE) uyumundaki değişikliklerin klinik ve fonksiyonel sonuçlar üzerindeki etkisi belirsizdir. Çalışmamızın amacı, ayak bileği kırıkları nedeniyle ameliyat edilen hastaların kısa dönem takiplerinde DTFE uyumunda meydana gelen değişiklikler ile klinik ve fonksiyonel sonuçlar arasındaki ilişkiyi değerlendirmektir.

GEREÇ VE YÖNTEM: Ayak bileği kırığı nedeniyle ameliyat edilen hastaların hastane kayıtları geriye dönük olarak incelendi. Ameliyattan en az 18 ay sonra iki taraflı ayak bileği bilgisayarlı tomografi (BT) taraması yapılan hastaların verileri kullanıldı. DTFE uyumu dört yöntem kullanılarak değerlendirildi. Metot 1'de tibia ve fibulanın en belirgin anteriyor noktaları arasındaki mesafe (anteriyor insisura [Aİ]) ve tibia ve fibulanın en belirgin posteriyor noktaları arasındaki mesafe (posterior insisura [Pİ]) ölçüldü. Metot 2'de fibulanın uzunlamasına aksının en belirgin anteriyor ve posteriyor noktasından tibiaya çizilen dik çizgi temel alınarak sırasıyla, direkt anteriyor (DA) ve direkt posterior (DP) mesafeleri ve tibianın en belirgin anteriyor noktasından DA'ya çizilen dik çizgi temel alınarak direkt translasyon (DT) mesafesi ölçüldü. Metot 3'de tibianın en belirgin anteriyor ve posteriyor noktasını birleştiren çizgi ile fibulanın en belirgin anteriyor ve posteriyor noktasını birleştiren çizgi arasındaki açı (rotasyon açısı [RA]) ölçüldü. İlk üç metotda, yaralı ve yaralı olmayan taraf arasındaki mesafe ve açı farkları (dAI, dPI, dDA, dDP, dDT, dRA) hesaplandı. Metot 4'de yaralı tarafta herhangi bir rotasyonel/translasyonel uyumsuzluk subjektif olarak rapor edildi. Klinik ve fonksiyonel değerlendirme için Amerikan Ortopedik Ayak ve Ayak Bileği Derneği (AOFAS) ayak bileği-ayak arkası skalası, Olerud-Molander Ayak Bileği Skoru (OMAS) ve Visual Analog Skala (VAS) kullanıldı.

BULGULAR: Otuz hasta (18 erkek, 12 kadın; ortalama yaş, 43.3 [dağılım, 20–78 yıl] yıl) çalışmaya dahil edildi. Ortalama takip süresi 37.6 (dağılım, 18–54 ay) aydı. dDA ve AOFAS-ağrı alt skalası arasında (r=-0.37; p=0.04), dDP ve OMAS arasında (r=-0.57; p=0.01) ve dDT ve AOFAS-ağrı, AOFAS-fonksiyon ve OMAS arasında (r=-0.55 p=0.01; r=-0.40; p=0.03; r=-0.39; sırasıyla p=0.04) negatif korelasyon belirlendi.

TARTIŞMA: dDA, dDP ve dDT değerlerindeki değişiklikler klinik ve fonksiyonel sonuçları etkilemektedir. Daha iyi sonuçlar elde etmek için bu parametreler DTFE'nin redüksiyonu sırasında hastanın anatomisine uygun olarak sağlanmalıdır.

Anahtar sözcükler: Ayak bileği kırıkları; bilgisayarlı tomografi; sindesmoz.

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