Original Article

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Clinical and Radiological Outcomes of Percutaneous K-wire Fixation versus Open Reduction and Internal Fixation for Lisfranc Injuries: A Retrospective Comparative Study

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Abstract

Aim: The optimal fixation strategy for Lisfranc injuries remains controversial, particularly regarding the choice between Kirschner wire (K-wire) fixation and screw-based open reduction and internal fixation (ORIF). This study aimed to compare the clinical, radiological, and complication-related outcomes of closed reduction and percutaneous pinning (CRPP) and ORIF in the treatment of Lisfranc injuries.

Methods: This retrospective comparative study included patients with Lisfranc injuries who were treated with either CRPP using K-wires or ORIF using screws. Demographic characteristics, injury patterns, and operative details were recorded. Functional outcomes were assessed using the American Orthopaedic Foot and Ankle Society (AOFAS) midfoot score, the foot and ankle ability measure-activities of daily living (FAAM-ADL), and the maryland foot score. Radiological evaluation included measurements of intermetatarsal and intercuneiform alignment, dorsal step-off, and tarsometatarsal joint congruity. Postoperative complications and the need for secondary arthrodesis were also analyzed.

Results: A total of 37 patients were included (CRPP: n=17; ORIF: n=20). Patients treated with ORIF demonstrated significantly higher functional scores, including the AOFAS, FAAM-ADL, and Maryland scores, compared with those in the CRPP group (p=0.001). Radiological assessment revealed better maintenance of alignment and a significantly lower dorsal step-off in the ORIF group. Overall complication rates did not differ significantly between groups. However, secondary arthrodesis was more frequently required following CRPP, whereas implant-related events and sensory disturbances tended to occur more often after ORIF, without reaching statistical significance.

Conclusion: Open reduction and internal fixation provided superior functional outcomes and better maintenance of midfoot alignment compared with CRPP. While K-wire fixation may be considered when ORIF is not feasible, rigid fixation with ORIF appears to offer a more reliable restoration of midfoot stability.

Keywords: Lisfranc joint, Kirschner wires, screw fixation, tarsometatarsal joint, foot

Introduction

The Lisfranc joint, also known as the tarsometatarsal (TMT) joint, represents the articulation between the bases of the five metatarsals and the distal surfaces of the three cuneiforms and the cuboid (1). The Lisfranc joint is stabilized by several ligaments, including the dorsal and plantar TMT ligaments and the intermetatarsal ligaments between the second and fifth metatarsals. Lisfranc injuries represent a relatively uncommon but clinically important form of midfoot trauma. Because of the critical role of the TMT joint complex in maintaining midfoot stability and load transmission during gait, disruption of this structure may lead to significant functional impairment (2). Delayed

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diagnosis or inadequate treatment has been associated with chronic midfoot pain, instability, collapse of the longitudinal arch, and post-traumatic osteoarthritis (2,3). Consequently, Lisfranc injuries are considered serious injuries that can result in substantial morbidity and long-term functional limitations if not appropriately managed.

Lisfranc joint injuries often demonstrate instability requiring operative stabilization. While restoration of anatomical alignment is essential for optimal recovery, post-traumatic arthritis continues to be a prevalent postoperative concern (4,5). Various treatment strategies have been proposed for Lisfranc joint injuries, including conservative management for stable injury patterns and surgical techniques such as percutaneous Kirschner wire (K-wire) fixation, open reduction and internal fixation (ORIF), or primary arthrodesis, which is particularly indicated in ligamentous injuries or when the articular surfaces are not reconstructible (6,7).

Open reduction and internal fixation is a well-established technique in the treatment of Lisfranc injuries. However, the need for extensive soft-tissue dissection and the associated risk of soft-tissue complications have driven the development of percutaneous fixation methods (8). In contrast, closed reduction and percutaneous pinning (CRPP) fixation eliminates the need for soft-tissue dissection and offers advantages, such as technical simplicity and a shorter operative time. Nevertheless, this technique has inherent limitations, including inferior biomechanical stability compared with ORIF (9,10).

Although ORIF is widely regarded as the standard surgical treatment for displaced Lisfranc injuries because it allows direct visualization and anatomical reduction, CRPP remains an attractive alternative in selected patients owing to its minimally invasive nature and reduced soft-tissue disruption. However, concerns persist regarding its ability, compared with that of more rigid fixation constructs, to achieve and maintain anatomical reduction. Given the distinct advantages and limitations of these two treatment strategies, comparative evidence regarding their clinical and radiological outcomes remains limited. Accordingly, this study aimed to systematically compare ORIF and CRPP in Lisfranc injuries by evaluating both clinical and radiological parameters, thereby providing a clearer understanding of their relative effectiveness in clinical practice. We hypothesized that CRPP would provide clinical and radiological outcomes comparable to those of screw-based fixation in the treatment of Lisfranc injuries.

Materials and Methods

Compliance with Ethical Standards

The study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the University of Health Sciences Türkiye, Istanbul Haseki Training and Research Hospital Non-Interventional Clinical Research Ethics Committee (approval no: 9-2026, date: 21.01.2026).

Patients and Study Design

This retrospective cohort study included patients with Lisfranc injuries who underwent CRPP or ORIF between January 2016 and December 2024, as identified from hospital records. The STrengthening the Reporting of observational studies in Epidemiology guidelines were followed when reporting study results (11). Demographic information, clinical data, injury classification, and radiological findings were obtained from the hospital database, patient charts, medical records, operation notes taken during follow-up visits, and radiological X-rays, which were stored in the Picture Archiving and Communication System. The inclusion criteria for this study were as follows: (1) patients diagnosed with Lisfranc injuries treated with either CRPP or ORIF with screws; (2) patients with ideal preoperative and postoperative weight-bearing anteroposterior (AP), oblique, and lateral X-rays. The exclusion criteria were (1) patients treated with plate fixation, suture button fixation, or a combination of fixation methods; (2) patients with open fractures or fracture-dislocations; (3) patients with a history of trauma or prior surgery on the affected foot; (4) inability to undergo radiologic examinations for measurements; and (5) discontinuous follow-ups. During the study period, 82 patients underwent surgery for a Lisfranc injury. As this was a retrospective cohort study, no a priori sample size calculation was performed. Instead, all eligible patients who met the predefined inclusion criteria and had complete clinical and radiological follow-up data were included in the final analysis. Of these, 37 patients met the inclusion criteria and were included in the final analysis.

Exclusions were due to failure to meet the predefined inclusion criteria, including treatment with a plate-screw combination (n=33), suture button fixation (n=3), and inadequate or suboptimal radiographs (n=4). Additionally, patients with discontinuous follow-up data (n=3) and those presenting with open fractures (n=2) were excluded (Figure 1).

The primary outcome of the study was the American Orthopaedic Foot and Ankle Society (AOFAS) Midfoot Score assessed at the final follow-up. Secondary outcomes included the foot and ankle ability measure-activities of daily living (FAAM-ADL) score, the maryland foot score (MFS), radiographic parameters (M1-M2 distance, C1-M2 alignment, C3-M3 alignment, and dorsal step-off), postoperative complications, and the need for secondary arthrodesis.

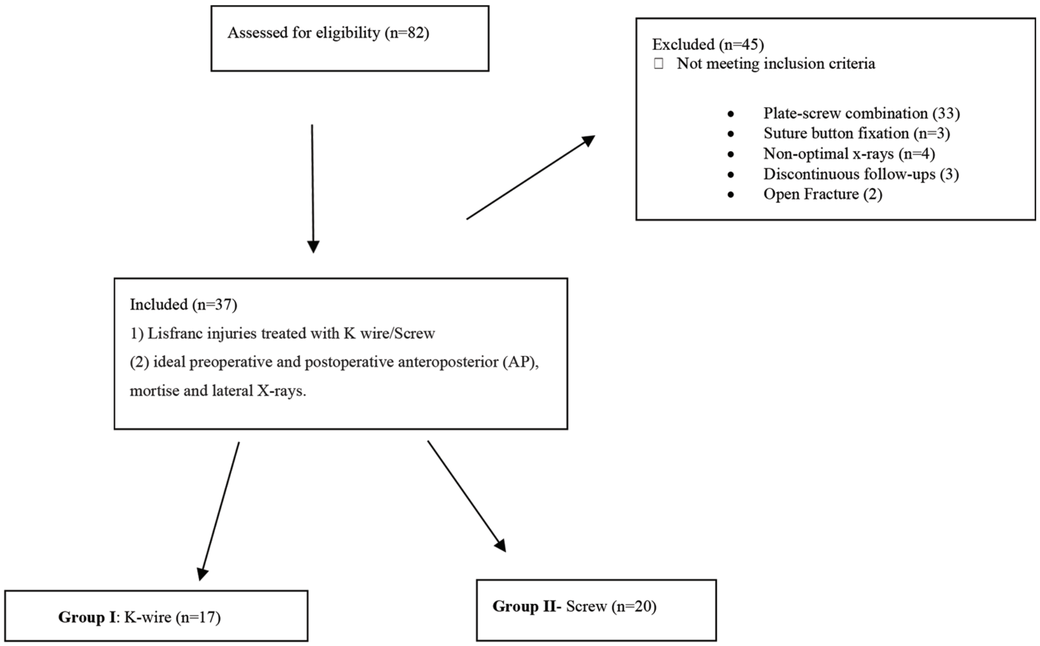

Figure 1. Flow diagram of the study

Surgical Technique

The choice of fixation technique was determined by the treating surgeon according to the fracture characteristics, individual patient factors, and routine clinical practice. Owing to the retrospective nature of the study, no predefined treatment allocation protocol was applied. In the ORIF group, all interventions were performed under general or regional anesthesia and with a tourniquet in the supine position. In cases where the third TMT joint is involved or where instability is present in the fourth or fifth metatarsals, a dual-incision technique is used. This includes a longitudinal incision over the first intermetatarsal space, complemented by a second longitudinal incision aligned with the fourth metatarsal. Reconstruction was performed in a stepwise manner. Intercuneiform instability, when present, was first stabilized with a 3.5-mm cannulated screw. The second metatarsal-intermediate cuneiform articulation, considered the keystone of the TMT complex, was then anatomically reduced using a reduction clamp and temporarily stabilized with K-wires. Definitive fixation was achieved with a 3.5-mm cannulated positioning screw. The Lisfranc articulation was then secured with a 3.5-mm cannulated transarticular screw inserted from the medial cuneiform to the base of the second metatarsal. The first TMT joint was subsequently reduced with a reduction clamp and fixed with one or two 3.5- or 4.5-mm cannulated screws. The remaining TMT joints were addressed sequentially from medial to lateral. The third TMT joint was stabilized when required. Injuries involving the fourth or fifth metatarsals were treated with K-wires inserted from the metatarsal bases into the cuboid, which were typically removed at 6-8 weeks postoperatively (Figure 2).

In the CRPP group, the TMT joints were reduced from medial to lateral, similar to the sequence used in the ORIF group. Manual traction was applied to the distal foot, and the first TMT joint was typically reduced using adduction and plantarflexion maneuvers. After reduction was achieved, a reduction clamp was applied when necessary, and K-wires were inserted percutaneously across the joint to maintain reduction under fluoroscopic guidance (Figure 3). If instability extended to the fourth and fifth TMT joints, these joints were also stabilized with K-wires. Reduction and K-wire positioning were confirmed under fluoroscopic guidance in the AP, lateral, and oblique views. All K-wires were removed at approximately eight weeks postoperatively.

Postoperative Rehabilitation

Postoperative management, including rehabilitation protocols, was individualized according to fracture morphology, fixation stability, and patient-specific factors. Immobilization with a short-leg cast or splint was maintained for 4 weeks. After removal of immobilization, controlled range-of-motion exercises were initiated. Partial weight-bearing was allowed between weeks 6 and 8 postoperatively, with progression to full weight-bearing by 12 weeks.

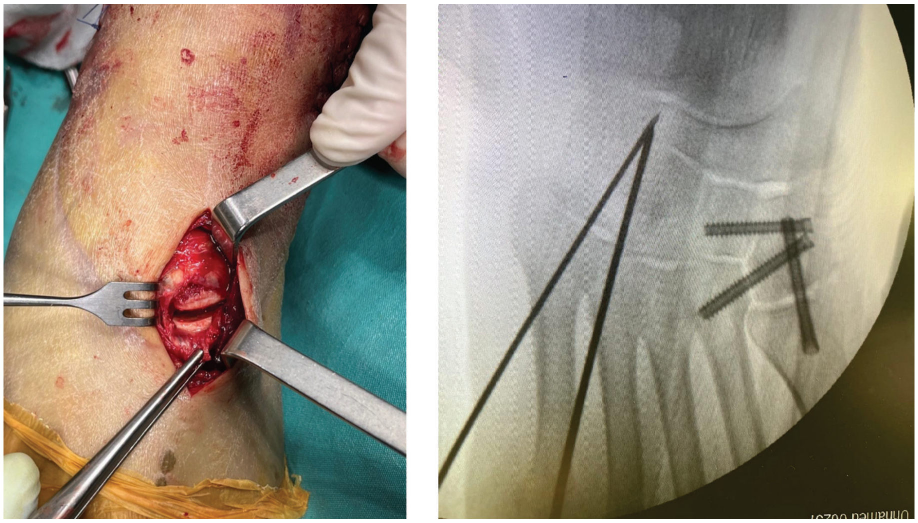

Figure 2. Intraoperative fluoroscopic image demonstrating fixation after open reduction of a Lisfranc injury. The first and second tarsometatarsal joints were stabilized with screw fixation, while the fourth and fifth metatarsals were stabilized using Kirschner wires

Figure 3. Intraoperative photograph demonstrating closed reduction and percutaneous K-wire fixation of a Lisfranc injury with reduction maintained using a Weber clamp

Radiographic Measurements

Postoperative weight-bearing AP, oblique, and lateral X-rays of the foot were obtained for all patients included in the analysis. Radiological parameters were evaluated in three categories based on AP, oblique, and lateral radiographs.

The first radiological parameter was the diastasis between the first and second metatarsals (M1M2), assessed on weight-bearing AP foot radiographs (Figure 4a-c). According to the instability classification described by Nunley and Vertullo (12), a first-second metatarsal distance of less than 1-2 mm is considered normal, whereas a diastasis of 2-5 mm indicates a subtle injury. A gap of ≥5 mm is typically associated with a reduction in medial arch height and is indicative of a more severe injury. In our study, the intermetatarsal distance was measured on the AP radiograph during the patient's final follow-up, using the criteria defined by Nunley and Vertullo (12).

The second radiographic parameter evaluated on weightbearing AP radiographs was the alignment between the medial cortex of the second metatarsal base and the corresponding medial cuneiform articulation (C1M2) (Figure 5a-c). This relationship was evaluated on the final follow-up weight-bearing AP image and classified as preserved or disrupted based on congruity at the second TMT joint.

The third parameter was assessed on the 30-degree oblique foot radiograph and was defined as the alignment between the lateral cuneiform and the base of the third metatarsal (C3M3) (Figure 6a and b). Specifically, congruity between the medial cortices of the third metatarsal base and the lateral cuneiform was evaluated. Any loss of cortical continuity was interpreted as a disruption of the corresponding TMT articulation. Alignment on the final oblique follow-up radiograph was categorized as preserved or disrupted based on visual assessment of cortical congruity. The radiological parameters assessed on lateral foot radiographs include the dorsal step-off. The dorsal step-off was measured at the level of the second TMT joint as the absolute distance between the proximal corner of the second metatarsal and the distal corner of the articulating tarsal bone, as previously described by De Bruijn et al. (13) (Figure 7a and b).

Clinical Evaluation

Patients were invited to attend a final visit to undergo a standardized clinical examination and complete four functional outcome questionnaires. All clinical assessments were conducted at the final follow-up by an experienced foot and ankle surgeon. Clinical outcomes were evaluated using the AOFAS Midfoot Score (14), the FAAM-ADL (15) and the MFS (16).

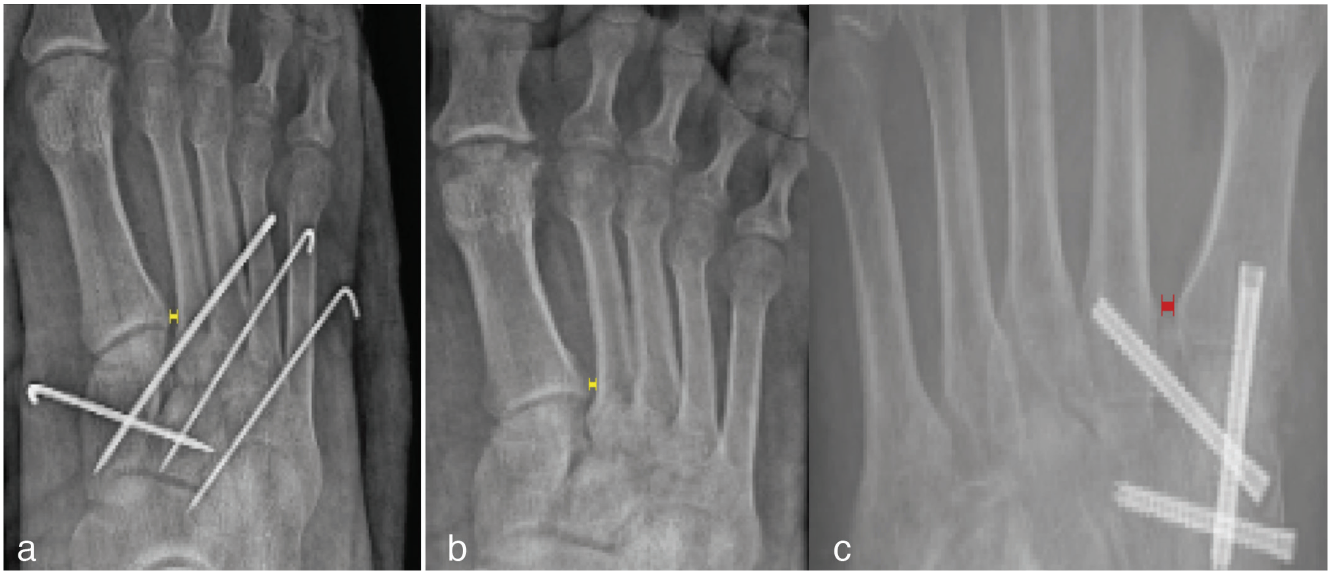

Figure 4. Intermetatarsal distance (M1M2); (a) CRPP group- early postop (yellow line), (b) Late postop following K-wire removal (yellow line), (c) screw group (red line)
CRPP: Closed reduction and percutaneous pinning

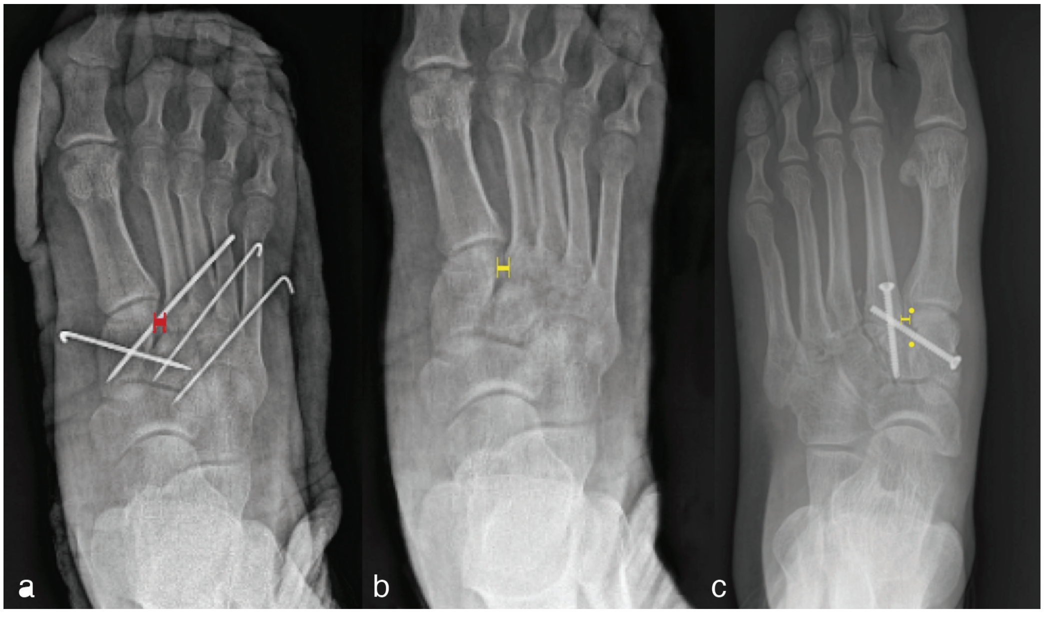

Figure 5. Cuneiform-second metatarsal distance (C1M2); (a) CRPP group- early postop (red line), (b) Late postop following K-wire removal (yellow line), (c) screw group (yellow line)
CRPP: Closed reduction and percutaneous pinning

Statistical Analysis

The study data were summarized using descriptive statistics, including mean, range, and standard deviation for continuous variables and percentages for categorical variables. Statistical analyses were performed using IBM SPSS Statistics version 27.0 (IBM Corp., Armonk, NY, USA). The normality of data distribution was assessed using the Shapiro-Wilk test. Categorical variables were compared between the two groups using the Fisher's exact test. Continuous variables were analyzed using the Student's t-test or the Mann-Whitney U test, as appropriate. All statistical tests were two-tailed, and statistical significance was defined as $p<0.05$.

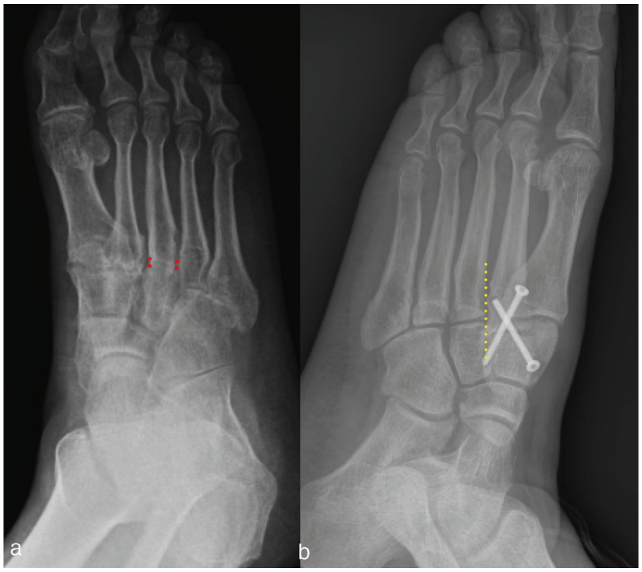

Figure 6. Lateral cuneiform-third metatarsal alignment (C3M3) in oblique X-rays; (a) CRPP group: late postop following K-wire removal (red dots) (b) Screw group (yellow dashed line)
CRPP: Closed reduction and percutaneous pinning

Results

A total of 37 patients were included in the study (CRPP: n=17; ORIF: n=20). No statistically significant differences were observed between the groups with respect to age, sex, body mass index, injury mechanism, Myerson classification, or follow-up duration ($p>0.05$), indicating comparable baseline characteristics (Table 1).

Radiographic evaluation demonstrated significantly better outcomes in the ORIF group, with lower M1-M2 distance and dorsal step-off values than those in the CRPP group ($p=0.012$ and $p=0.006$, respectively). No significant differences were observed in other radiographic parameters (Table 2).

Clinically, the ORIF group showed significantly superior functional outcomes, with higher AOFAS, FAAM-ADL, and Maryland scores ($p\leq0.001$). Ankle dorsiflexion was also significantly greater in the ORIF group ($p=0.013$), whereas plantar flexion did not differ significantly between the groups ($p=0.078$; Table 3).

Complications of CRPP and ORIF Techniques

Overall complication rates were comparable between the groups, with no statistically significant differences observed for individual complications. However, secondary arthrodesis was observed only in the CRPP group (3 cases), a finding that may be clinically relevant despite not reaching statistical significance ($p=0.09$; Table 4).

Discussion

The present study demonstrated that screw-based fixation was associated with superior functional and radiological outcomes compared with CRPP in the treatment of Lisfranc injuries, while overall complication rates were comparable between the two techniques. Patients treated with ORIF showed significantly higher functional scores, including the AOFAS, FAAM-ADL, and Maryland scores, and improved ankle dorsiflexion. Radiologically, the ORIF

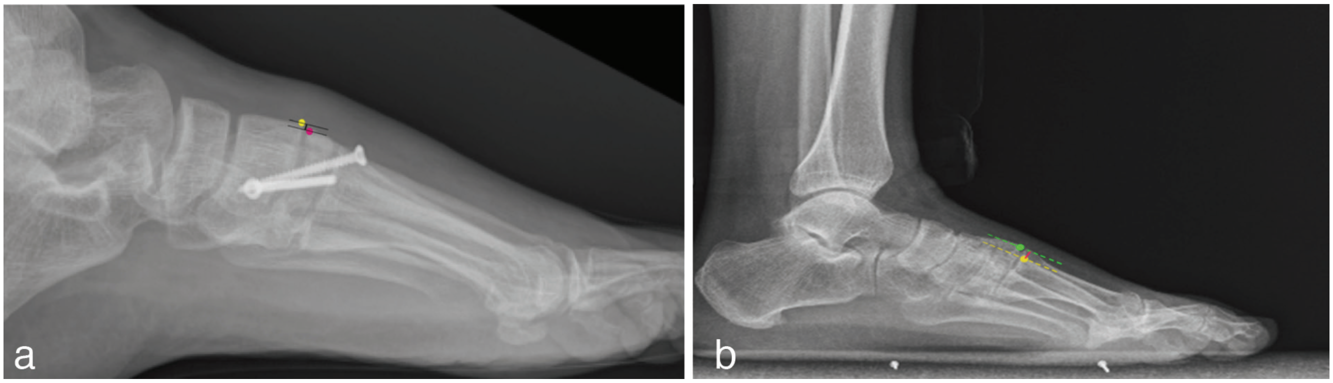

Figure 7. Measurement of the dorsal step-off: Measured as the absolute distance between the proximal corner of the metatarsal bone & the distal corner of the articulating tarsal bone; (a) screw group, (b) CRPP group; late postop following K-wire removal
CRPP: Closed reduction and percutaneous pinning

Table 1. Demographic characteristics of the patients				
		Group 1 CRPP (n=17)	**Group 2 ORIF (n=20)**	**p-value**
Age (year)	**Mean ± SD** **Min-max**	32.57±11.66 (23-61)	36.80±10.90 (20-62)	p=0.625*
Side	**Right (R)** **Left (L)**	9 (52.9%) 8 (47.1%)	10 (50%) 10 (50%)	p=0.88**
Sex	**Female** **Male**	6 (35.2%) 11 (64.8%)	7 (35%) 13 (65%)	p=0.201**
BMI (kg/m²)	**Mean ± SD** **Min-max**	26.8±3.77 (21-34.6)	27.1±3.52 (20.8-35.9)	p=0.358*
Myerson classification **A** **B1** **B2** **C1** **C2**		 5 (29.4%) 2 (11.8%) 8 (47.1%) 1 (5.9%) 1 (5.9%)	 3 (15%) 1 (5%) 12 (60%) 3 (15%) 1 (5%)	p=0.66**
Injury type **Fall** **Traffic accident** **Crush**		 7 (41.2%) 8 (47.1%) 2 (11.8%)	 13 (65%) 5 (25%) 2 (10%)	p=0.357**
Follow up (mo)	**Mean ± SD** **Min-max**	26.12±8.13 (12-54)	28.73±7.45 (14-60)	p=0.332*

*Mann-Whitney U **Fisher's exact test
CRPP: Closed reduction and percutaneous pinning, ORIF: Open reduction and internal fixation, BMI: Body mass index, SD: Standard deviation

Table 2. Comparison of radiographic parameters between groups				
		Group 1 CRPP (n=17)	**Group 2 ORIF (n=20)**	**p-value**
M1M2 distance (mm)	**Mean ± SD** **Min-max**	2.02±0.32 (1.1-3.4)	1.65±0.61 (0.7-2.4)	**p=0.012***
C1M2 distance (mm)	**Mean ± SD** **Min-max**	2.01±0.87 (1.2-4.2)	1.57±0.95 (0.6-3.54)	**p=0.15***
C3M3 alignment	**Preserved alignment** **loss of alignment**	13 4	17 3	**p=0.68****
Dorsal step-off (mm)	**Mean ± SD** **Min-max**	1.54±0.47 (0-3.7)	0.62±1.03 (0-1.8)	p=0.006*

*Mann-Whitney U, **Fisher's exact test
CRPP: Closed reduction and percutaneous pinning, ORIF: Open reduction and internal fixation, M1M2: First-second metatarsal distance, C1M2: Medial cortical distance between the medial cuneiform and second metatarsal, C3M3: Medial border alignment of the lateral cuneiform and third metatarsal, SD: Standard deviation

Table 3. Comparison of clinical outcome scores between the CRPP and ORIF groups					
		Group 1 (CRPP) (n=17)	**Group 2 ORIF (n=20)**	**p-value**	**Cohen's d**
AOFAS-midfoot	**Mean ± SD** **Min-max**	70.47±8.25 (61-88)	79.54±7.78 (58-94)	**p=0.001***	1.13
FAAM ADL	**Mean ± SD** **Min-max**	68.47±9.77 (51-88)	78.15±8.73 (58-93)	**p=0.001***	1.05
MFS	**Mean ± SD** **Min-max**	68.63±7.65 (36.18-77.25)	82.96±8.25 (29.57-98.80)	**p=0.001***	1.80
Dorsiflexion	**Mean ± SD** **Min-max**	15.94±3.56 (10-22)	18.55±2.68 (10-25)	**p=0.013***	0.84
PlantarFlexion	**Mean ± SD** **Min-max**	28.31±3.72 (20-35)	30.25±2.78 (20-40)	p=0.078*	0.60

*Mann-Whitney U
CRPP: Closed reduction and percutaneous pinning, ORIF: Open reduction and internal fixation, AOFAS: American Orthopaedic Foot and Ankle Society, FAAM-ADL: Foot and ankle ability measure-activities of daily living, SD: Standard deviation, MFS: Maryland foot score

Table 4. Comparison of postoperative complications between the CRPP and ORIF groups			
	Group 1 CRPP (n=17)	Group 2 ORIF (n=20)	p-value
Implant breakage (n)	0	2	0.49**
Compartment syndrome (n)	0	0	NA
Reflex sympathetic dystrophy (n)	4	2	0.38**
Superficial infection (n)	0	3	0.79**
Deep infection (n)	0	1	1.00**
Malunion (n)	4	1	0.15**
Reoperation-secondary arthrodesis (n)	3	0	0.09**

**Fisher's Exact test
CRPP: Closed reduction and percutaneous pinning, ORIF: Open reduction and internal fixation

group demonstrated significantly lower M1-M2 distances and dorsal step-off values, indicating better maintenance of anatomical reduction. Contrary to our initial hypothesis, CRPP did not demonstrate clinical and radiological outcomes comparable to those of screw-based fixation. Although CRPP offers the theoretical advantages of reduced soft-tissue disruption and a less invasive surgical approach, the present findings suggest that these benefits may not fully compensate for the reduced mechanical stability associated with K-wire fixation. In summary, these results suggest that more rigid fixation constructs may be beneficial, especially in adult patients with unstable Lisfranc injuries.

Functional outcome scores are key indicators of recovery after Lisfranc injuries and closely correlate with the quality of anatomical reduction. In this context, several studies have evaluated the clinical outcomes of different fixation techniques. Sánchez-Gómez et al. (17) reported significantly higher AOFAS scores in patients treated with screw fixation compared to those managed with K-wires, suggesting that improved stability and maintenance of reduction may contribute to better functional outcomes. Similarly, Uzun et al. (18) demonstrated that screw fixation provided more favorable radiological alignment and maintenance of reduction, which may be associated with improved clinical results over time. Conversely, Dudko et al. (19) reported satisfactory functional outcomes following K-wire fixation, particularly in low-energy injuries, emphasizing that acceptable results can be achieved when anatomical reduction is properly obtained. In addition, a multicenter study by Adachi et al. (20) found comparable functional outcomes between K-wire and screw fixation techniques, indicating that neither method showed clear superiority in terms of functional recovery. In contrast to adult populations, a study in pediatric and adolescent patients reported favorable midterm outcomes regardless of fixation method, with K-wires being commonly used and sufficient when anatomical reduction is achieved (21). These findings suggest that fixation type may be less critical in younger populations, where biological healing potential and lower mechanical demands may play a greater role in recovery. In the present study, however, screw-based fixation was associated with significantly superior clinical outcomes across multiple functional scoring systems, including AOFAS, FAAM-ADL, and Maryland scores, compared with percutaneous K-wire fixation. This finding suggests that in adult patients, more rigid fixation may be necessary to achieve and maintain optimal alignment and to facilitate improved functional recovery in Lisfranc injuries.

Radiological evaluation is essential for assessing the quality of reduction and long-term stability of the Lisfranc joint complex, with parameters such as intermetatarsal distance, joint alignment, and dorsal step-off, which closely correlate with clinical outcomes. In this context, Ghate et al. (22) reported that both screw and K-wire fixation could achieve satisfactory results; however, they emphasized that the accuracy and maintenance of anatomical reduction were the primary determinants of successful outcomes rather than the fixation method alone. A recent study by Talia et al. (23) highlighted that while both K-wire fixation and transarticular screw fixation are commonly used, screw-based constructs tend to provide greater stability and may be more effective in maintaining anatomical reduction over time, particularly in unstable injury patterns. The authors also emphasized that loss of reduction remains a key factor associated with inferior outcomes, further emphasizing the necessity of stable fixation. The findings of this study indicate that ORIF was associated with improved radiological alignment, as reflected by lower M1-M2 distances and dorsal step-off values. These results suggest that more rigid fixation may facilitate more reliable restoration and maintenance of anatomical reduction, which may ultimately contribute to improved functional outcomes.

Postoperative complications represent an important consideration when comparing fixation techniques for Lisfranc injuries. Previous studies indicate that Kirschner-wire fixation and screw fixation have largely comparable complication profiles, although certain differences exist.

For instance, screw fixation has been associated with a higher rate of implant-related complications, whereas K-wire fixation tends to be associated with minor complications, particularly in low-energy injuries with adequate reduction (17,19). Multicenter studies have suggested that complications such as malunion, infection, and secondary arthrodesis may occur regardless of fixation method, highlighting the influence of injury severity and reduction quality. More recent evidence further indicates that postoperative complications are more strongly associated with patient- and injury-related factors than with the fixation technique itself (20,24). In line with these findings, overall complication rates were similar between the CRPP and ORIF groups in this study. After ORIF, implant-related problems and sensory disturbances were more common. After CRPP, alignment-related problems and secondary arthrodesis were more common. However, none of these differences were statistically significant, and the infection rates were similar between the two groups.

The higher incidence of secondary arthrodesis after CRPP may be clinically meaningful despite the lack of statistical significance, as secondary arthrodesis is generally regarded as an indicator of persistent instability, post-traumatic degeneration, or inadequate maintenance of midfoot alignment following Lisfranc injury treatment (23). In the present study, secondary arthrodesis was required in three patients in the CRPP group, whereas no patients in the ORIF group required secondary arthrodesis during follow-up. Although ORIF demonstrated a lower rate of secondary arthrodesis in our cohort, recent meta-analyses have shown that secondary arthrodesis may still be necessary in a subset of patients following ORIF despite satisfactory initial reduction and fixation, likely due to the development of post-traumatic degeneration over time (23,25,26). Supporting this observation, Almaat et al. (27) recently evaluated 8,101 patients who underwent ORIF for Lisfranc injuries and reported a remarkably low long-term conversion rate to secondary arthrodesis (2.7% at 5 years and 2.8% at 10 years). Despite a substantial rate of implant-related reoperations, the low incidence of secondary fusion suggests that joint-preserving ORIF provides durable midfoot stability over time for the majority of patients.

Study Limitations

This study has several limitations that should be considered when interpreting its findings. First, the retrospective design and the absence of randomization may have introduced selection bias and limited the ability to establish causal relationships. In addition, a substantial proportion of initially screened patients were excluded based on predefined eligibility criteria, primarily because they underwent alternative fixation methods or lacked adequate radiographic follow-up. Although these criteria were applied to create a more homogeneous study population, the relatively high exclusion rate may have contributed to selection bias and limited the generalizability of the findings.

Second, operations were performed by different surgeons during the study period, and variations in surgical technique and decision-making may have influenced outcomes. Third, a single foot-and-ankle specialist who was not blinded to the study conducted the clinical evaluations, which may have introduced assessment bias. Furthermore, radiographic measurements were not assessed for interobserver or intraobserver reliability, which may affect the reproducibility of these findings because all measurements were performed by a single observer. Fourth, the relatively small sample size may have resulted in an underpowered analysis, limiting the ability to detect statistically significant differences, particularly in less frequent outcomes such as complications and secondary arthrodesis. Additionally, the small sample size precluded the use of multivariable analysis, which may have limited the ability to fully account for potential confounding factors. Although functional outcomes were evaluated using established scoring systems, the minimal clinically important difference was not formally assessed, which should be considered when interpreting the clinical relevance of the results. Despite these limitations, this study provides a direct comparison of two commonly used fixation strategies—open reduction with screw fixation and percutaneous K-wire fixation—and contributes meaningful clinical and radiological data to the literature. Although the sample size is relatively small, the findings underscore the potential importance of rigid fixation in achieving improved outcomes for patients with Lisfranc injuries.

Conclusion

Our findings suggest that screw-based fixation is associated with superior functional outcomes and better maintenance of midfoot alignment compared with K-wire fixation. Although K-wire fixation may be considered an alternative in selected patients, particularly when open reduction cannot be performed, ORIF was associated with improved outcomes in this cohort. However, future adequately powered multicenter prospective studies are warranted.

Ethics

Ethics Committee Approval: Ethical approval was obtained from the University of Health Sciences Türkiye, Istanbul Haseki Training and Research Hospital Non-Interventional Clinical Research Ethics Committee (approval no: 9-2026, date: 21.01.2026).

Informed Consent: Written informed consent for the use of anonymized clinical data was obtained from all patients.

Footnotes

Authorship Contributions

Surgical and Medical Practices: M.E., Concept: M.E., Design: M.E., Data Collection or Processing: E.K., Analysis or Interpretation: E.K., M.E., Literature Search: E.K., Writing: E.K., M.E

Conflict of Interest: The authors declared that there were no conflicts of interest.

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