

Dr. Segler's Award-Winning Research

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Frequency of Accurate Radiographic Diagnosis of Tarsometatarsal Fracture-Dislocations

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BACKGROUND

Lisfranc's fracture-dislocations have been cited as being frequently missed or misdiagnosed in the literature.^{1,3} A number of radiographic abnormalities have been identified as being highly suggestive of a Lisfranc's joint fracture dislocation. One such indication is an isolated gapping of the medial intercuneiform joint with a diastasis of 2-5 mm between the bases of the 1st and 2nd metatarsals that may be visualized on the anteroposterior (AP) projection.⁴ The "fleck sign" is the presence of a small osseous fragment noted within Lisfranc's joint and is another isolated abnormality of the AP view that has been shown to be consistent with avulsion of Lisfranc's ligament and probable joint disruption.⁵

Foster and Foster determined that malalignment of the medial cortex of the base of the 2nd metatarsal with the medial cortex of the intermediate cuneiform was abnormal and highly suggestive of a Lisfranc's fracture-dislocation.⁶ This has since been confirmed by other investigators.^{7,9}

Fractures of the bases of the metatarsals with dorsolateral displacement evidenced by cortical "step-off" on the medial oblique or lateral view have also been stated to be easily visualized and predictive of a poor outcome if not reduced surgically.¹⁰ Another study found a consistently poor result in patients that had loss of height of the longitudinal arch as noted by the medial cuneiform being positioned plantar to base of the 5th metatarsal on the lateral radiograph.¹¹

It has been repeatedly noted that restoration of anatomic alignment with reduction of a diastasis between the bases of the 1st and 2nd metatarsals and medial and intermediate cuneiforms correlates with a good prognosis.^{10,12,13} It has also been noted that a lack of anatomic reduction correlates with continued midfoot pain, swelling, and the development of midfoot instability and arthrosis.^{14,16}

Because it is unlikely that appropriate treatment will be rendered in a Lisfranc's fracture dislocation that goes unrecognized, it is important that it be accurately diagnosed. The present investigation seeks to determine the frequency with which clinicians in various specialties may note the radiographic abnormalities considered to be evident of Lisfranc's fracture dislocations. The investigation also seeks to evaluate the consistency with which the various clinicians recommend therapies shown to offer the best prognosis.

RESULTS

➤ Logistic regression analysis found Podiatric Physicians were 80.5 times more likely (p<.01) and Orthopedic Surgeons were 32.5 times more likely (p<.05) than Family Practice Physicians or Emergency Physicians to recognize a diastasis of the first and second metatarsal bases as an abnormality.

➤ Podiatric Physicians were 68.5 times more likely (p<.01) and Orthopedic Surgeons were 51.3 times more likely (p<.01) than Family Practice Physicians or Emergency Physicians to make the correct diagnosis.

➤ Orthopedic Surgeons were 46.2 times more likely (p<.01) and Podiatric Physicians were 31.3 times more likely (p<.01) than Family Practice Physicians or Emergency Physicians to make appropriate treatment recommendations.

➤ Emergency Physicians did not differ significantly from Family Practice Physicians.



Figure 1. "Diastasis" with popping of medial intercuneiform joint with a diastasis greater than between lateral cortex of 1st metatarsal base and medial cortex of 2nd metatarsal base.

Figure 2. "Malaligned 2nd" with deviation of alignment of medial cortex of the second metatarsal with medial cortex of the intermediate cuneiform.

Figure 3. "Cortical step-off" with a discontinuity of the medial margin of a lesser metatarsal as viewed on the MO or Lateral view.

Figure 4. "Fleck sign" with an avulsion of distal radiograph between bases of 1st and 2nd metatarsals in intercuneiform space.

	diastasis	malalignment of the 2nd tarsometatarsal joint	fleck sign	cortical step-off of the lesser metatarsals	loss of arch height	correct diagnosis	correct treatment
Podiatric Surgeons	45% (n=27)	56.67% (n=17)	20% (n=6)	66.67% (n=20)	70% (n=7)	60% (n=36)	50% (n=30)
Orthopedic Surgeons	28.33% (n=17)	43.33% (n=13)	13.33% (n=4)	43.33% (n=13)	60% (n=6)	55% (n=33)	56.67% (n=34)
Emergency Physicians	10% (n=6)	3.33% (n=1)	10% (n=3)	26.67% (n=8)	20% (n=2)	16.67% (n=10)	5% (n=3)
Family Practice	1.67% (n=1)	10% (n=3)	3.33% (n=1)	26.67% (n=8)	100% (n=10)	6.67% (n=4)	6.67% (n=4)
All Clinicians	21.25% (n=51)	28.33% (n=34)	11.67% (n=14)	40.83% (n=49)	62.5% (n=25)	34.17% (n=82)	29.58% (n=71)

Table 1. Accuracy of responses by clinician group.



Figure 5. "Loss of height" was defined as abnormal osseous architecture with decreased acuity of the medial longitudinal arch as evidenced by the medial cuneiform being positioned plantar to base of the 1st metatarsal on the lateral view.

MATERIALS AND METHODS

➤ Six case sets of plain radiographs were selected to include various radiographic abnormalities identified as being consistent with Lisfranc's fracture-dislocations.

➤ All six patients had suffered Lisfranc injuries that were initially misdiagnosed, mistreated and developed secondary complications.

➤ A corresponding clinical history accompanied each case.

➤ Forty clinicians board certified in one of four medical specialties likely to encounter these patients were asked to read the clinical history, evaluate the radiographs, note radiographic abnormalities, make a diagnosis, and recommend treatment.

➤ Clinicians included Emergency Medicine Physicians, Family Practice Physicians, Podiatric Surgeons, and Orthopedic Surgeons.

➤ Response sheets was evaluated to determine if the radiographic abnormalities were correctly identified, if the radiographic diagnosis was correctly made, and if the recommended treatment was consistent with that which has been associated with a positive clinical outcome.

➤ Multivariable logistic regression analysis (SAS Version 8.02, Cary, NC) was performed to determine the relative probability of a given specialist recognizing the radiographic abnormalities, making the diagnosis, and recommending appropriate treatment.

➤ Statistical significance was defined as p<.05.

CONCLUSIONS

This investigation demonstrates that Podiatric Surgeons and Orthopedic Surgeons are substantially more skilled than Emergency Physicians and Family Practice Physicians at recognizing radiographic abnormalities consistent with Lisfranc's fracture-dislocations and more frequently recommend treatment consistent with the best prognosis. Yet even highly trained foot specialists miss a significant proportion of the injuries on plain radiography. This ominous given that a delay in diagnosis is correlated poor functional outcome and the presence of compensation claims.²²

It is clear that many physicians likely to encounter these injuries are not adept at recognizing these fracture patterns. Because it is unlikely that appropriate surgical treatment will be rendered in tarsometatarsal fracture-dislocations that go unrecognized, a high index of suspicion should be maintained in order to prevent the loss of function and poor clinical outcome associated with a delay in diagnosis and treatment.

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