CT Density Analysis of the Medial Cuneiform

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My disclosure is in the Final AOFAS Program Book.
I have no potential conflicts with this presentation.
Background

- A cannulated lag screw inserted through the medial cuneiform into the base of the second metatarsal is currently utilized to reduce and hold the diastasis and aid healing of a Lisfranc ligament injury.
Background

- The medial cuneiform is a cancellous bone with variable density
- The objective of this study was to identify the densest part of the medial cuneiform bone into which a screw can be directed aiming to obtain best purchase possible
Methods

• CT scans of 60 patients ranging in age from 18 to 47 were randomly selected

• Mean CT intensity in Hounsfield units was measured at 12 sampled locations within the medial cuneiform

  • 3 cross sections were utilized moving anterior to posterior

  • Each of the 3 cross sections was divided into 4 quadrants and data was collected from a consistently sized circular area within each quadrant

• Differences among the 12 sampled regions were assessed by ANOVA
Results

• All results correlated CT intensity with bone density

• Males had greater bone density than females ($p < 0.001$)

• No difference in bone density among races ($p = 0.28$)

Table 1. Adjusted-mean density (Hounsfield Units), with 95% confidence interval, for each gender, race, and location.

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<thead>
<tr>
<th>Gender</th>
<th>Female</th>
<th>Male</th>
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<tbody>
<tr>
<td>African American</td>
<td>315 (295-334)</td>
<td>321 (309-333)</td>
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<tr>
<td>Caucasian</td>
<td>331 (297-345)</td>
<td>321 (309-333)</td>
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<tr>
<td>Hispanic</td>
<td>304 (287-322)</td>
<td>321 (309-333)</td>
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<td></td>
<td>489 (460-519)</td>
<td>349 (320-379)</td>
<td>330 (301-359)</td>
<td>333 (304-363)</td>
<td>443 (414-473)</td>
<td>353 (324-382)</td>
<td>225 (196-254)</td>
<td>208 (179-237)</td>
<td>365 (335-394)</td>
<td>302 (272-331)</td>
<td>165 (136-194)</td>
<td>198 (169-228)</td>
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Results

• The anterior-dorsal-lateral site was significantly denser than all other sites (p<0.001) except the middle-dorsal-lateral (p=0.53)
• The posterior-plantar-lateral site was significantly less dense than all other sites (p<0.001) except the middle-plantar-lateral/medial and the posterior-plantar-medial sites (p<0.14)
• A general trend of density increasing in the anterior and dorsal directions is evident

Figure 1: Graphical representation of adjusted-mean densities at sampled locations within the medial cuneiform. Density is indicated by the level of grey, with black indicating least dense and white most dense.
Discussion

• This is the first study to date to measure density of the medial cuneiform using living subjects
  ▪ Largest sample size of any study measuring density of medial cuneiform\textsuperscript{2,3}
  ▪ Previous study by Pelt et al used 10 cadaveric feet and only analyzed the medial wall of the medial cuneiform \textsuperscript{2}
Conclusion

- The densest area of the medial cuneiform is the most anterior, dorsal, and lateral portion
- **Clinical Significance:** May indicate that most optimal screw placement for Lisfranc repair would be to pass through that area
