

# 2019 NEHS Annual Meeting Abstract Submission

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ABSTRACT TITLE *	Bone Density Alterations on Computed Tomography in Scaphoid Waist Fractures: A Predictor of Non-union
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Name of who will present abstract at NEHS meeting on December 6, 2019 Please note that the same person cannot present more than one abstract at the meeting. *	Satoshi Miyamura
Please indicate if the presenter is: *	<ul style="list-style-type: none"><li>• Not currently a resident or fellow</li></ul>
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## ABSTRACT – should include background information and a description of methods, programs, or practices. \*

**Background:** There is evidence that scaphoid waist non-unions exhibit different bone density distributions compared with those that unite. We quantitatively compared the 3-dimensional (3-D) bone density on computed tomography (CT) scans of subacute scaphoid waist fractures that went onto non-union or union, and to evaluated the correlation of conventional 2-dimensional (2-D) CT images to 3-D bone-density models.

**Methods:** We constructed 3-D models from 17 subacute scaphoid waist fracture CTs that did not unite (non-union group), 17 age-matched scaphoid waist fracture CTs that healed (union group) and 17 age-matched control CTs without injury (control group). We measured the 3-D bone density for the distal and proximal fragments relative to the triquetrum bone density and compared findings among the three groups. We then performed bone density measurements using 2-D CT and evaluated the inter-observer and intra-observer agreement as well as correlation with 3-D bone densities. We identified the optimal cutoff with diagnostic values of the 2-D method to predict non-union with receiver operating characteristic (ROC) curves.

**Results:** In the non-union group, both the distal (100.2%) and proximal (126.6%) fragments had a significantly higher bone density compared to the union (distal: 84.4%; proximal:107.6%) or control groups (distal: 91.6%; proximal: 109.1%) using the 3-D bone density measurement ( $p < 0.05$  for all comparisons). Two-dimensional measurements were highly correlated to 3-D bone density measurements ( $R = 0.85-0.90$ ). Using 2-D measurements, ROC curves revealed the optimal cutoffs of 90.8% and 117.5% for distal and proximal fragments. This led to a sensitivity of 1.00 if either of cutoffs is met and a specificity of 0.82 when both cutoffs are met.

**Conclusions:** Using 3-D modeling software, non-unions were found to exhibit bone density increases in both the distal and proximal fragments in subacute CTs performed during the course of treatment. Two-dimensional bone density measurements using standard CT scans correlate well with 3-D models. In patients that present with scaphoid fractures sub-acutely, CT measurements of bone density may be useful in predicting non-union.

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