An Anthropometric Assessment of Proximal Hamate Autograft for Scaphoid Proximal Pole Reconstruction

Wu K, Padmore C, Lalone E, and Suh N

Purpose: Scaphoid non-union and avascular necrosis following proximal pole fractures presents a difficult surgical problem. This anthropometric study assesses the fit of the ipsilateral proximal hamate for use as an autologous bone graft for scaphoid proximal pole reconstruction.

Methods: Twenty-nine cadaveric specimens (15 males, 14 females; mean age 70 ± 11.28 years) underwent computed tomography and 3D reconstruction of the scaphoid and hamate. The length of the scaphoid was measured (Mimics Materialise NV, Belgium) and a third of the length was used to delineate the proximal scaphoid and hamate to simulate a proximal third scaphoid fracture and hamate autograft. Using computational modelling, the proximal scaphoid and hamate were divided into 6 sections for comparison: dorsal, middle, and volar radioscaphoid, and dorsal, middle, and volar scaphocapitate segments. These 6 areas were compared using an iterative point-to-point distance algorithm to determine average distance between the surfaces of the proximal hamate and proximal scaphoid.

Results: The mean length of the scaphoid was 27.9mm ± 2.7mm and the mean length of the divided proximal pole and proximal hamate was 9.3mm ± 0.93mm. The mean absolute distance between the graft and native scaphoid was smallest in the middle scaphocapitate (0.508mm ± 0.195 mm), volar scaphocapitate (0.546mm ± 0.266mm), and middle radioscaphoid segments (0.557mm ± 0.407mm). Meanwhile, the mean distance was largest in the dorsal scaphocapitate (0.675mm ± 0.295mm), volar radioscaphoid (0.736mm + 0.290mm), and dorsal radioscaphoid segments (0.751mm + 0.316mm). Females had smaller average absolute distances in all sections as compared to males (p<0.05). Furthermore, the hamate was undersized in the volar radioscaphoid (73.5%), volar scaphocapitate (71.0%), and dorsal scaphocapitate segments (55.7%) and oversize in the middle radioscaphoid (61.7%), middle scaphocapitate (53.7%), and dorsal radioscaphoid segments (51.3%).

Conclusions: The proximal hamate is a suitable anthropometric autograft for scaphoid proximal pole reconstruction. The mean distances between proximal hamate autograft and native scaphoid were largest in the dorsal scaphocapitate, volar radioscaphoid, and dorsal radioscaphoid segments suggesting these areas would require osteotomy to achieve adequate fit.