

# An Assessment of Proximal Humerus Density with Reference to Stemless Implants

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**J Shoulder Elbow Surg (2018) 27, 641–649**

The abstract can be found at: <https://doi.org/10.1016/j.jse.2017.09.019>

Understanding Wolff's law, bone that is stressed above a certain point, will remodel and in the absence of stress, bone will resorb. Currently, there are more than five different stemless shoulder arthroplasty systems cleared in the U.S. with designs ranging from impacted to screw-like designs. In reviewing published literature, the authors were not able to find data associated with stemless designs and incidence and prevalence of bone resorption. The purpose of this computed tomography (CT) study was to evaluate proximal humeral density and what potential stemless implant design may reduce resorption.

This CT evaluation of 98 osteoarthritic patients mapped regional variations in average bone density in five subsections: central, anterior, posterior, medial and lateral subsections in addition to slice depths of 5 mm of trabecular bone starting under the cortical shell of the humeral head articular surface and parallel to the implant resection plane. Determination of an implant resection plane was calculated by manually identifying landmarks. Finally, average density results were compared between gender.

## Key takeaways

- The slice depth, subsection region and gender all had significantly different average density results by depth, region and gender.
- The depths with the greatest average density was the area above the resection plane and density decreased the more distal the slices went down the canal.
- In measuring the average density of subsections of each slice, the more central trabecular bone was less dense than the peripheral and medial sections.
- When comparing the results between genders, male patients had significantly higher densities on average than that of females.
- In conclusion, as the trabecular bone of the humerus varies in average density by depth and location, stemless implant designs should take advantage of the more dense peripheral regions of the resection plane within the first 15–20 mm beneath the humeral head resection plane.

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Content ID: AP-013808B 18-Mar-2022

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