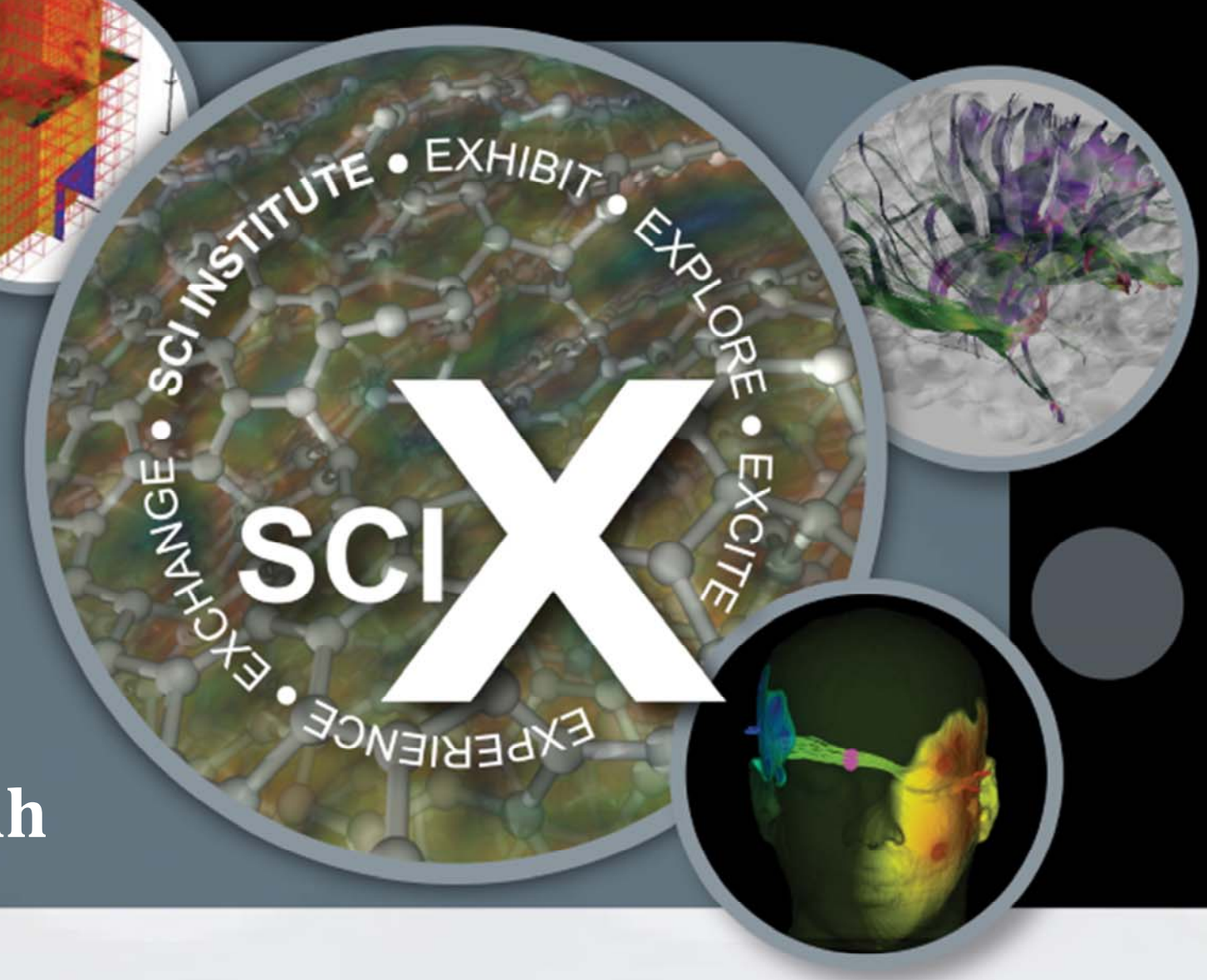


Quantitative Analysis of Femoral Cortical Bone Thickness using Shape Analysis



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Hip Osteoarthritis

- Cortical bone contributes to the majority of load bearing within the hip.
- Understand how cortical thickness is distributed over femoral head in controls and cam FAI patients.
- Group differences indicate increased growth in anterosuperior and anterolateral regions of the head-neck junction due to location of cam lesion.

Data: Segmented femurs – controls (45), CAM-FAI (28)

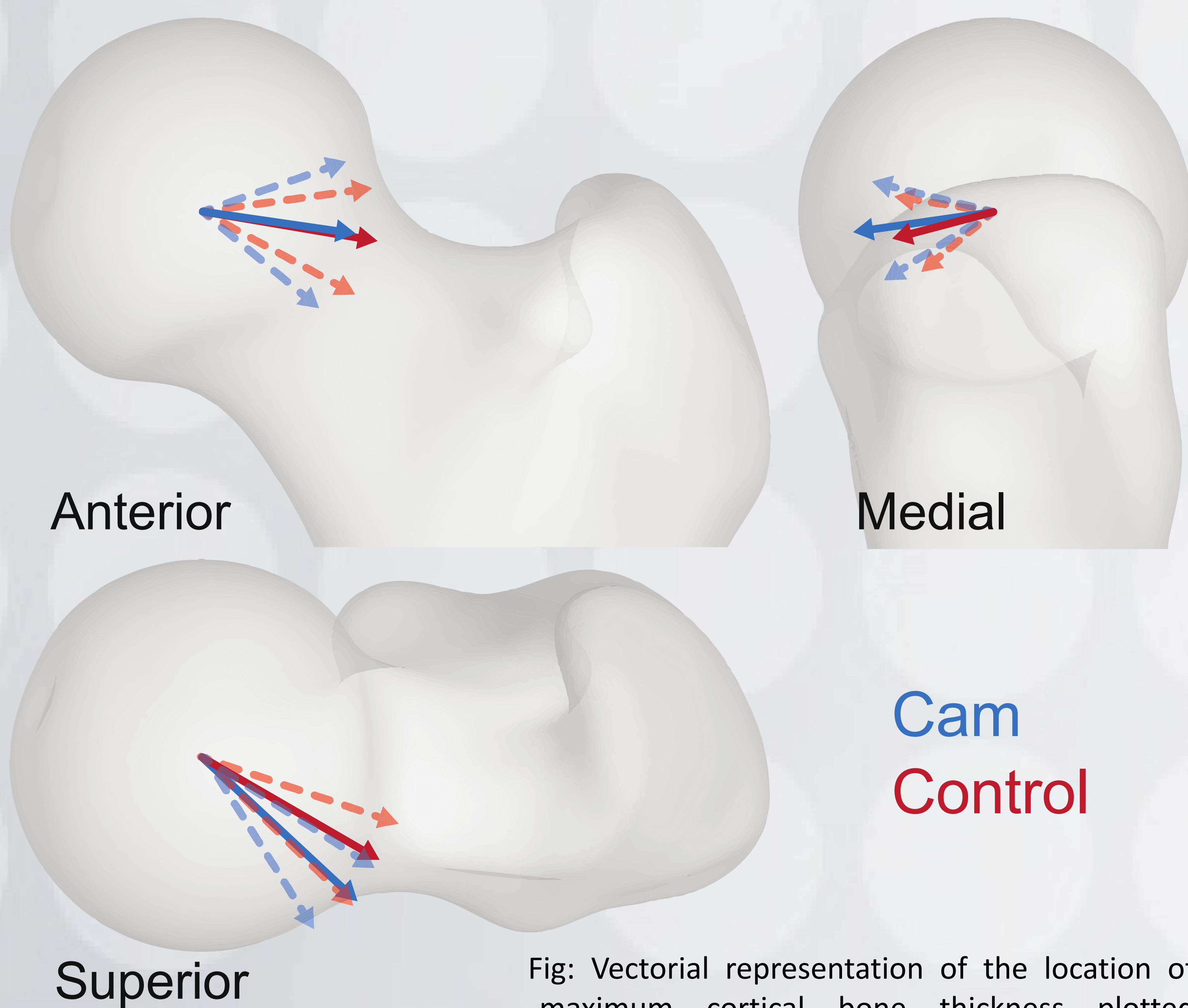


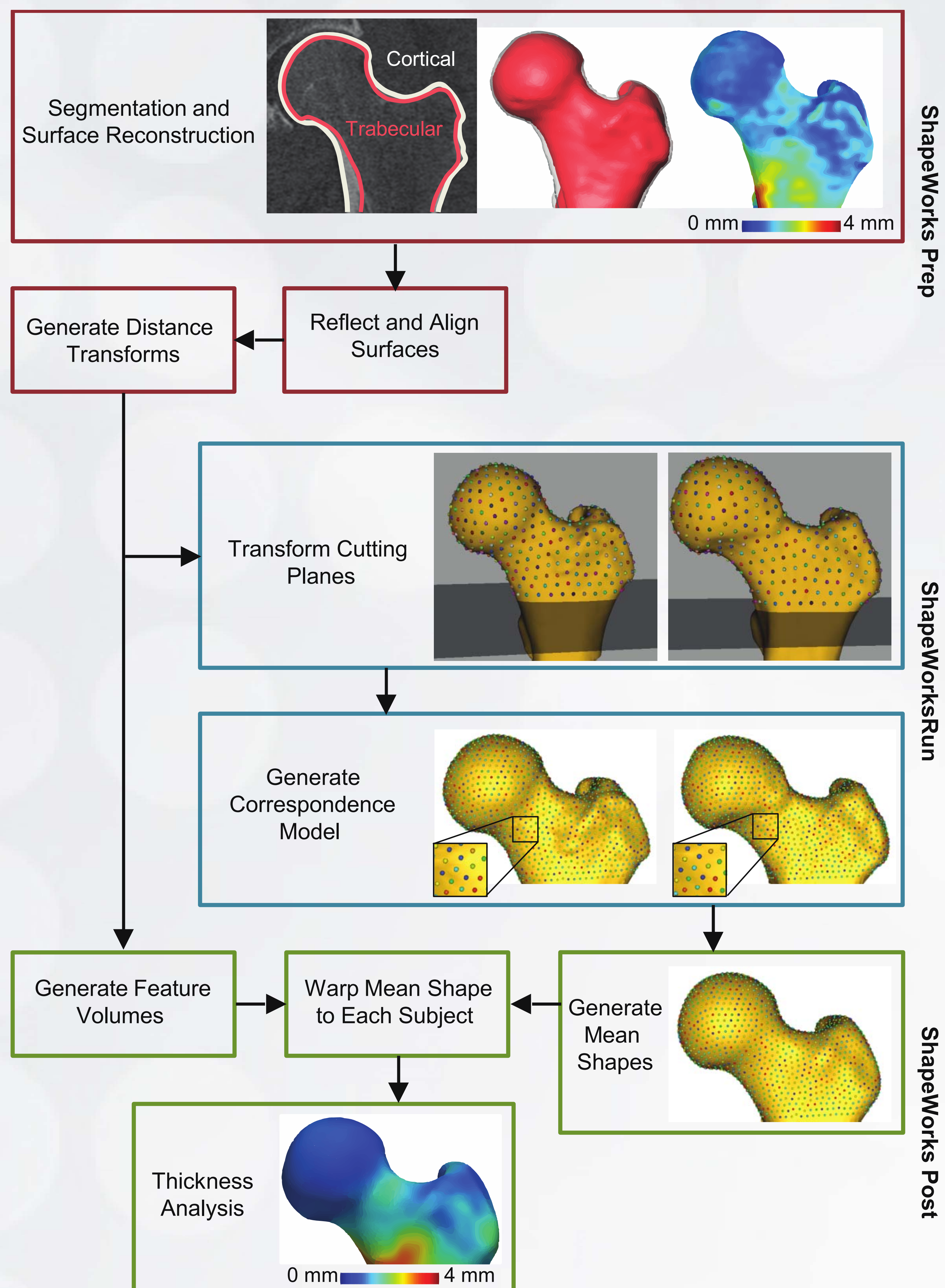
Fig: Vectorial representation of the location of maximum cortical bone thickness plotted relative to the mean shape of the control group.

Challenges in Surgical Solution

Surgical debridement to shave off cortical bone

- How 'much' to shave off and 'from where'?
- Can we quantify variation of thickness in femoral head?

Approach



Results

- Quantify the variability in femur bone and what are dominant modes of shape variability?
- Does cortical thickness vary between two groups – CAM and Control, if yes, what is/are the region(s) of interest?

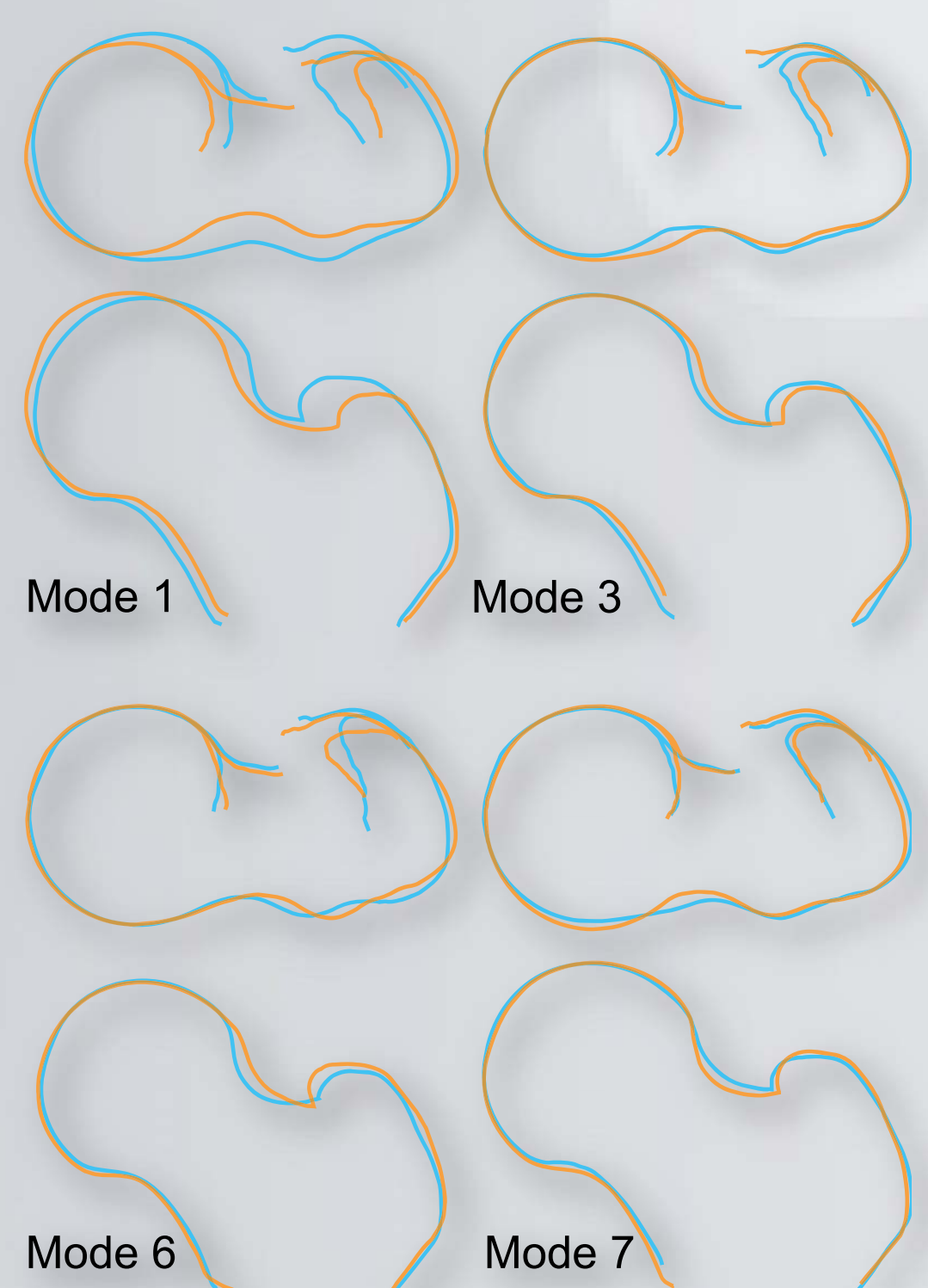


Fig: Variation of plus (blue) and minus (red) two standard deviations of significant PCA modes from mean shape.

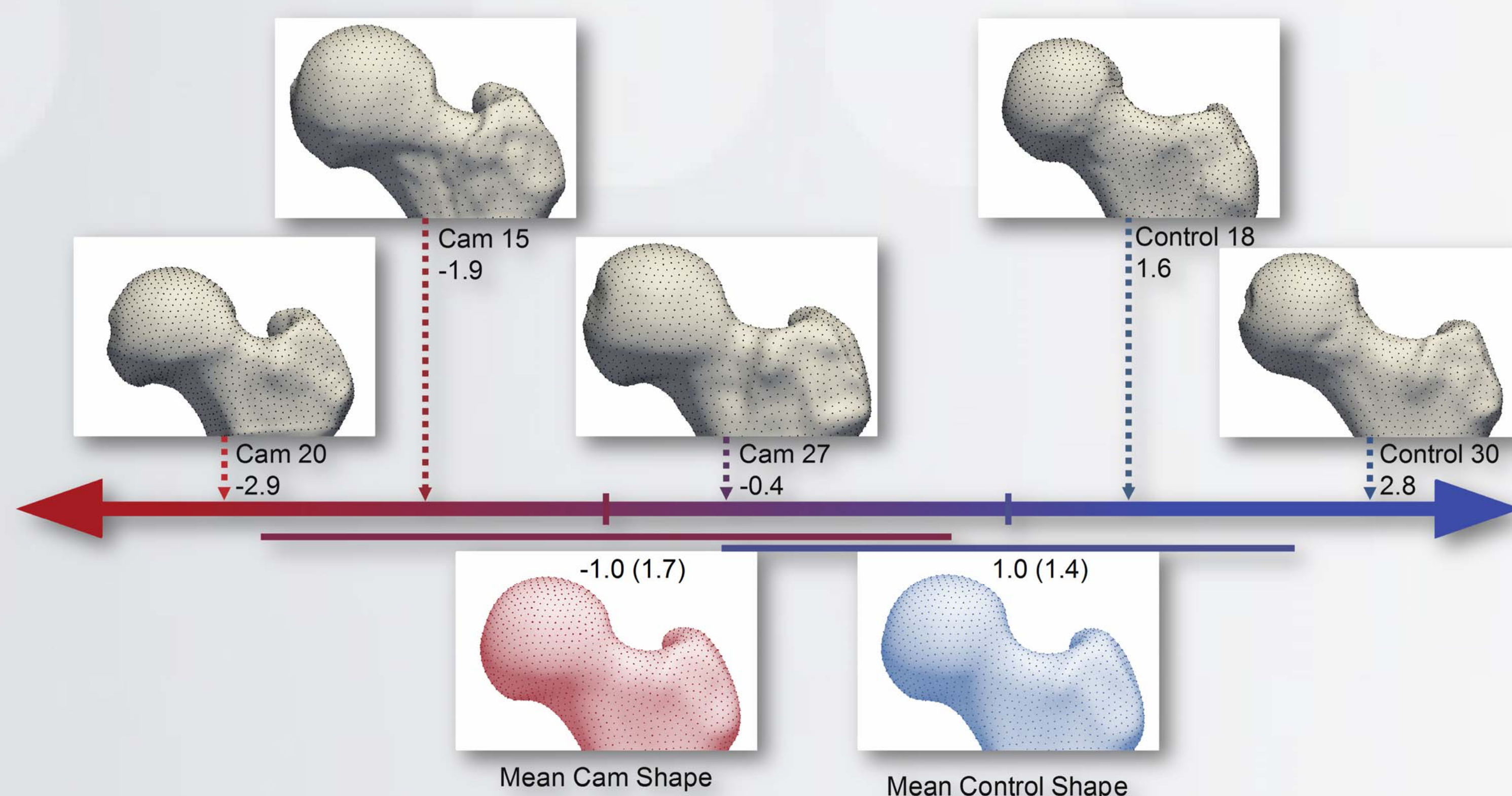


Fig: Linear discriminant analysis of variation between mean CAM and mean Control shapes using correspondence model.

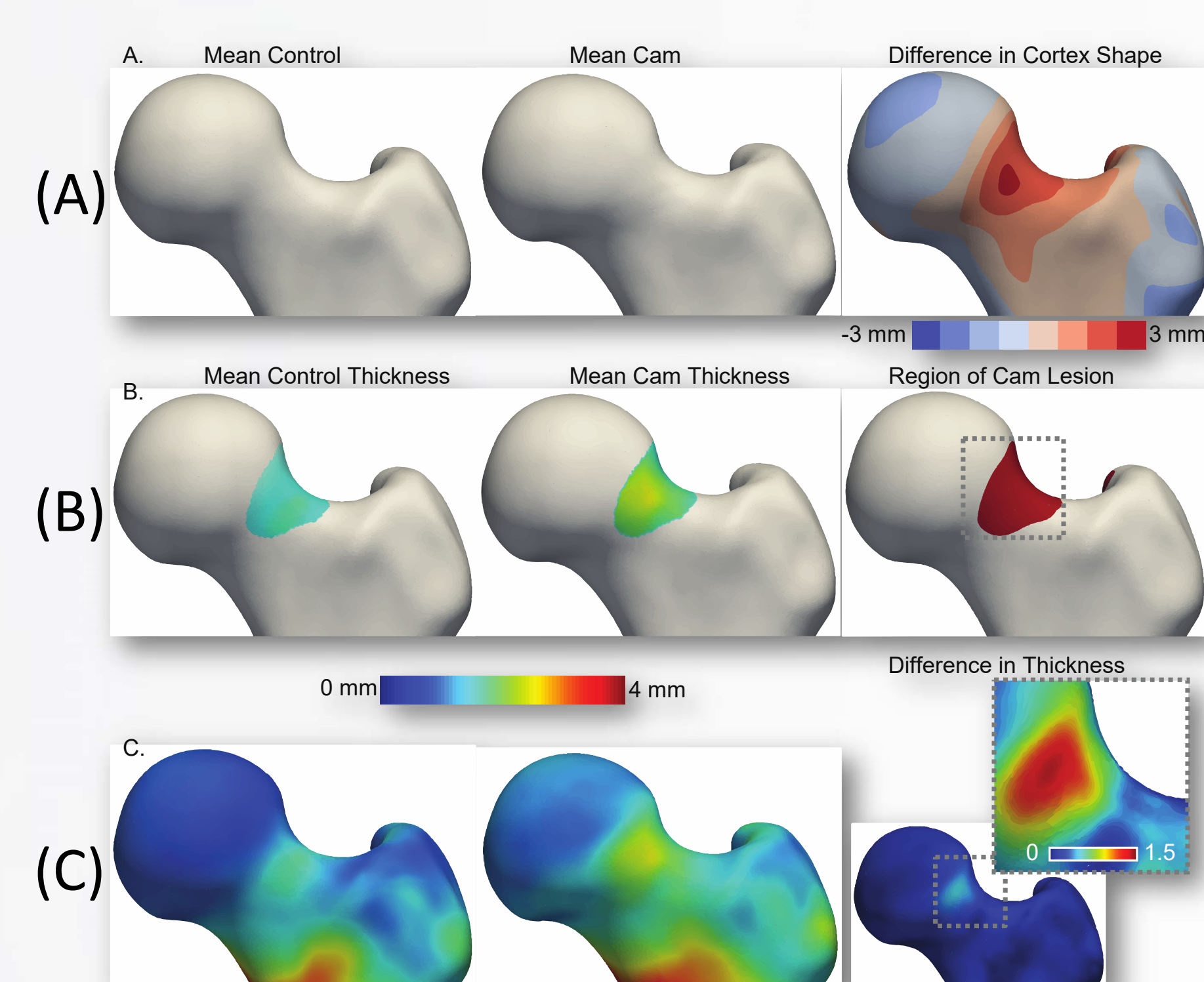


Fig: Analysis of groupwise means, (A) Shape differences, (B-C) Difference in mean cortical thickness with emphasis over region of interest.

Penny R. Atkins, Shireen Y. Elhabian, Praful Agrawal, Michael D. Harris, Ross T. Whitaker, Jeffrey A. Weiss, Christopher L. Peters, and Andrew E. Anderson. "Quantitative comparison of cortical bone thickness using correspondence-based shape modeling in patients with cam femoroacetabular impingement." *Journal of Orthopaedic Research*.
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