MICHIGAN STATE UNIVERSITY

# Radionomics Analysis of Deltoid Muscle on Pre-Operative Shoulder Imaging for Reverse Total Shoulder Arthroplasty

Henry J. Lee[1], Christina Hill[2], Humza Bhatti[2], Arya Sharma[3], Perra Razoky, M.D.[4], Prateek Chintalapati, M.D.[4], Lisa Doan[5], Adam Alessio Ph.D.[3], Stephanie Muh, M.D.[4], Chad Klochko, M.D.[4]

[1]Michigan State University College of Osteopathic Medicine, [2]Michigan State University College of Human Medicine, [3]Michigan State University, [4]Henry Ford Hospital, [5]Wayne State University School of Medicine

## INTRODUCTION

- Reverse total shoulder arthroplasty (rTSA) is a common procedure used to correct rotator cuff pathologies.
- Previous studies have demonstrated that deltoid muscle volume has an association with rTSA outcomes.
- Goals of this study:
  - 1. Use radiomics and AI techniques to characterize preoperative deltoid muscle volume from CT and US
  - 2. Analyze if US can provide similar muscle information as CT

## METHODS

- This retrospective study includes 75 patients aged 18-89 that underwent an US and CT of the shoulder within 2 years prior to a rTSA between 1/1/2014 to 12/31/2022.
- US images of the anterior deltoid are captured by centering the US probe along the long head of the biceps tendon.
- The deltoid muscle in both modalities were manually segmented and analyzed with AI techniques for summary shape and intensity features to determine if US can provide similar muscle information as CT.

## RESULTS

- CT (75 subjects) revealed a mean deltoid volume of 293+/-106 cm³ and 1.6% average decrease in volume for each year of age.
- The apparent mean mass was calculated to be 303+/-111g (calculated from approximate density estimated from mean CT number times volume).
- US (33 subjects) yielded a mean deltoid thickness of 0.91+/-0.23cm.
- Correlation coefficient of CT derived volume and US derived deltoid thickness is determined to be 0.45 with a standard error of 89 cm³.
- This suggests US can be used as a weak predictor of deltoid volume.

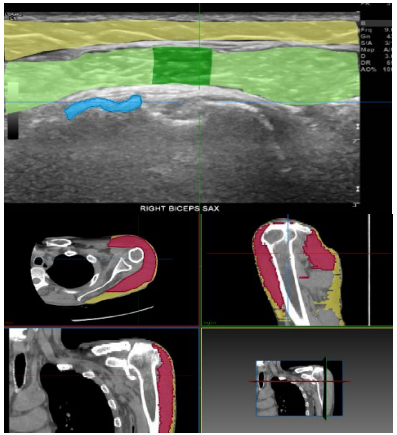



Fig 2. Manual segmentation of anterior deltoid and subcutaneous fat from US and CT image

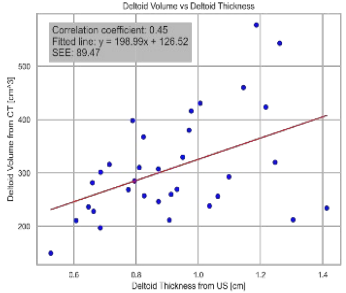



Fig 1. Summary of correlation between CT and US derived measures of deltoid volume suggesting that US can estimate deltoid volume coarsely (within 89 cm³).

## CONCLUSION

- This preliminary analysis of preoperative imaging for rTSA suggests that CT can be used to characterize deltoid size and shape.
- US provides correlative data that may be used to predict deltoid volume and mass.
- Future work is needed to evaluate US ability to predict CT information and if this information can correlate with postoperative outcomes.

## REFERENCES

1.Rajabzadeh-Oghaz H, Kumar V, Berry DB, et al. Impact of Deltoid Computer Tomography Image Data on the Accuracy of Machine Learning Predictions of Clinical Outcomes after Anatomic and Reverse Total Shoulder Arthroplasty. *Journal of Clinical Medicine*. 2024;13(5):1273. doi:https://doi.org/10.3390/jcm13051273

**ULTRASOUND CAN BE USED AS A WEAK PREDICTOR OF DELTOID VOLUME.**

Contact: Henry J. Lee | leehenr2@msu.edu

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