

Verifying Predictive Models for Determining Final Implant Volume in Two-Stage Implant-Based Breast Reconstruction

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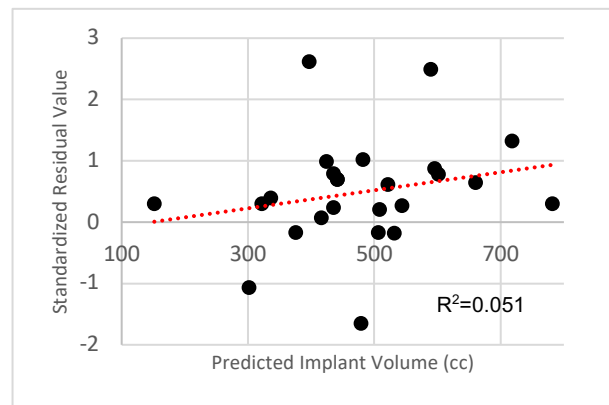
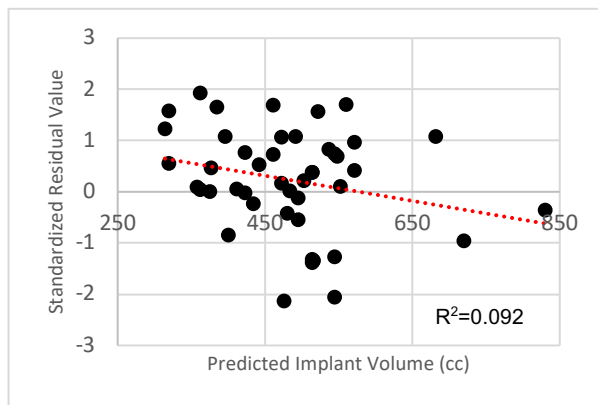
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Background: Most breast reconstructions following mastectomy utilize a two-stage tissue expander (TE) to implant approach. Prior studies on both prepectoral and subpectoral breast reconstructions have identified formulas for predicting final implant volume using TE size and final fill. The aim of this study is to test the accuracy of these models.

Methods: A retrospective chart review of patients that underwent two-stage TE to permanent implant breast reconstruction within the Duke University Health System between 2021 and 2023 was performed. Demographic, oncologic, and reconstructive data were collected. The equations $26.6 + 0.38*(TE \text{ final fill}) + 0.61*(TE \text{ size})$ for prepectoral and $71.7 + 0.8*(TE \text{ final fill}) + 0.1*(TE \text{ size})$ for subpectoral reconstructions were used to calculate predicted final implant volumes, which were then compared to actual implant volumes.

Results: 70 prepectoral patients (117 breasts) and 40 subpectoral patients (68 breasts) met criteria for inclusion. All patients had at least 2 months of postoperative follow-up. The average predicted implant volume was 24cc less than the average actual volume (478 vs. 502cc). The root-mean-square errors (RMSEs) for each data set were 73.6 and 59.5cc, respectively.

Conclusions: In general, both models underpredicted final implant volume. Depending on the implant profile, a 60-75cc difference equates to the models being accurate within 3-4 sizes for prepectoral and 2-3 sizes for subpectoral reconstructions, suggesting their potential use as a starting point to guide surgeon decision-making. Being able to predict final implant volume more accurately will optimize surgical planning, decrease the number of implants ordered for each case, and reduce costs.



Figures 1 and 2: Standardized residuals plotted against predicted final implant volumes in prepectoral (left) and subpectoral (right) breast reconstructions.