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

Tara D. Thomason, BS[1], Amanda R. Sergesketter, MD[2], Brett T. Phillips, MD, MBA[2]

[1]Duke University School of Medicine, Durham, NC; [2]Department of Surgery, Division of Plastic and Maxillofacial Surgery, Duke University Medical Center, Durham, NC.

BACKGROUND

- Most breast reconstructions following mastectomy utilize a two-stage tissue expander (TE) to implant approach.
- The decision of what implant size to use is multi-faceted.
- Approximation leads to implant over-ordering and increased costs.
- Prior studies have identified formulas for predicting final implant volume using TE size and final fill.

OBJECTIVE

- To test the accuracy of predictive models for final implant volume.

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.
- The models below were used to calculate predicted final implant volumes, which were then compared to actual implant volumes.

PREPECTORAL

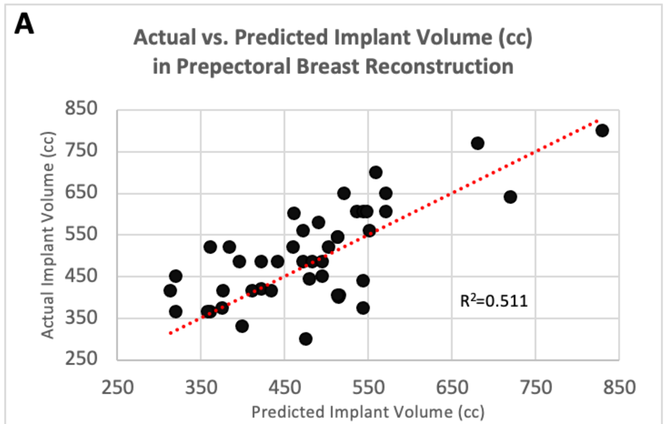
Implant Volume = 26.6 + 0.38*(TE final fill) + 0.61*(TE size)

SUBPECTORAL

Implant Volume = 71.7 + 0.8*(TE final fill) + 0.1*(TE size)

RESULTS

PREPECTORAL



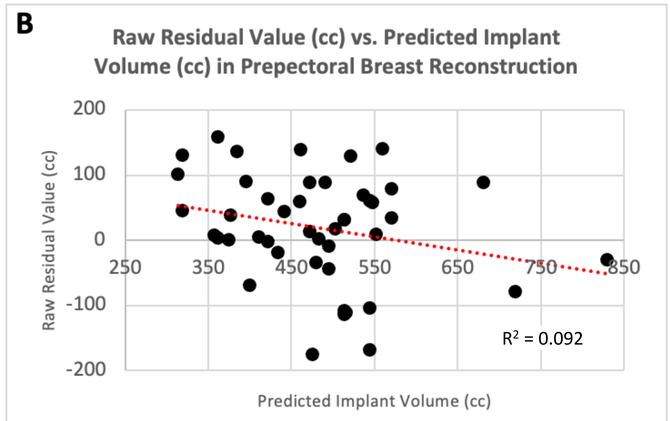
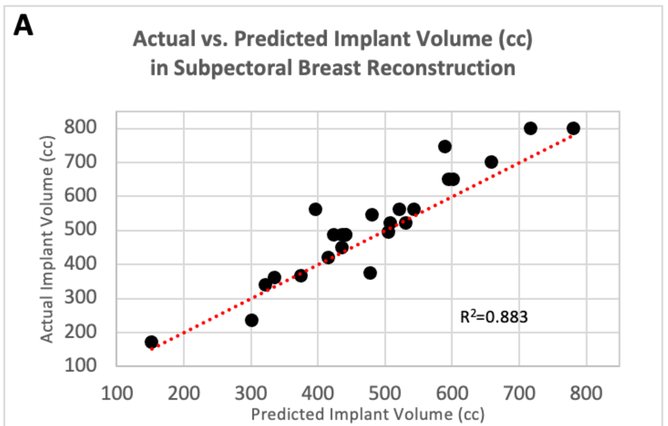


Figure 1A: Actual vs. final implant volumes plotted against predicted final implant volumes in prepectoral breast reconstructions.
Figure 1B: Raw residuals plotted against predicted final implant volumes in prepectoral breast reconstructions.

SUBPECTORAL



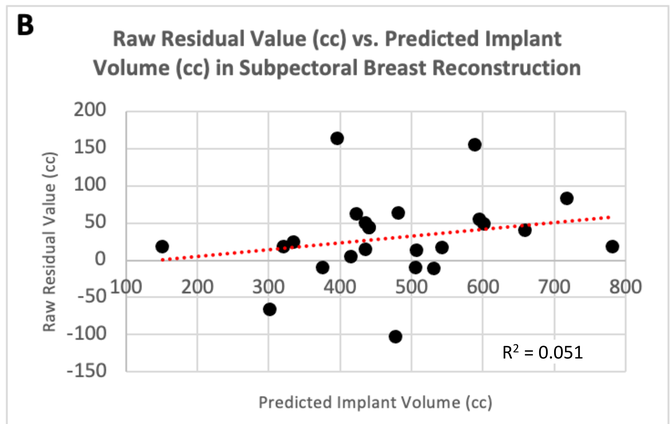


Figure 2A: Actual vs. final implant volumes plotted against predicted final implant volumes in subpectoral breast reconstructions.
Figure 2B: Raw residuals plotted against predicted final implant volumes in subpectoral breast reconstructions.

RESULTS

	Prepectoral	Subpectoral
Sample Size	70 patients (117 breasts)	40 patients (68 breasts)
Mean Predicted Volume	479.7cc	476.8cc
Mean Actual Volume	505.7cc	496.4cc
Root Mean Square Error	73.6cc	59.5cc

CONCLUSIONS

- Both models underpredicted final implant volume and were accurate within 3-4 sizes for prepectoral and 2-3 sizes for subpectoral reconstructions; however, a larger sample size is needed to further validate these results.
- 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.

REFERENCES

1. American Society of Plastic Surgeons. 2020 plastic surgery statistics report. Available at https://www.plasticsurgery.org/documents/News/Statistics/2020/plastic-surgery-statistics-full-report-2020.pdf. Accessed May 2023.
2. Atia AN, Sergesketter AR, Morris MX, et al. Predicting Final Implant Volume in Two-stage Prepectoral Breast Reconstruction. *Plastic and Reconstructive Surgery – Global Open* 11(1):p e4780, January 2023. | DOI: 10.1097/GOX.0000000000004780
3. Gabrick, KS, Markov, NP, Chouairi, F, et al. A Predictive Model for Determining Permanent Implant Size During 2-Stage Implant Breast Reconstruction. *Plastic and Reconstructive Surgery - Global Open* 6(5):p e1790, May 2018. | DOI: 10.1097/GOX.0000000000001790