Providence St. Joseph Health
Providence St. Joseph Health Digital Commons

View All Washington/Montana GME | Washington/Montana GME

2022

The Impact of Preoperative Breast Characteristics on Immediate Breast Reconstruction Complications: A Multivariate analysis of Tissue Expander and Autologous Reconstruction

Jeffrey N. Li

Sumeer S. Teotia

Nicholas T. Haddock

Follow this and additional works at: https://digitalcommons.psjhealth.org/gme_wamt_all

 Part of the Medical Education Commons, Surgery Commons, and the Tissues Commons

The Impact of Preoperative Breast Characteristics on Immediate Breast Reconstruction Complications: A Multivariate analysis of Tissue Expander and Autologous Reconstruction

Jeffrey N. Li, MD; Sumeet S Teotia, MD; Nicholas T. Haddock, MD

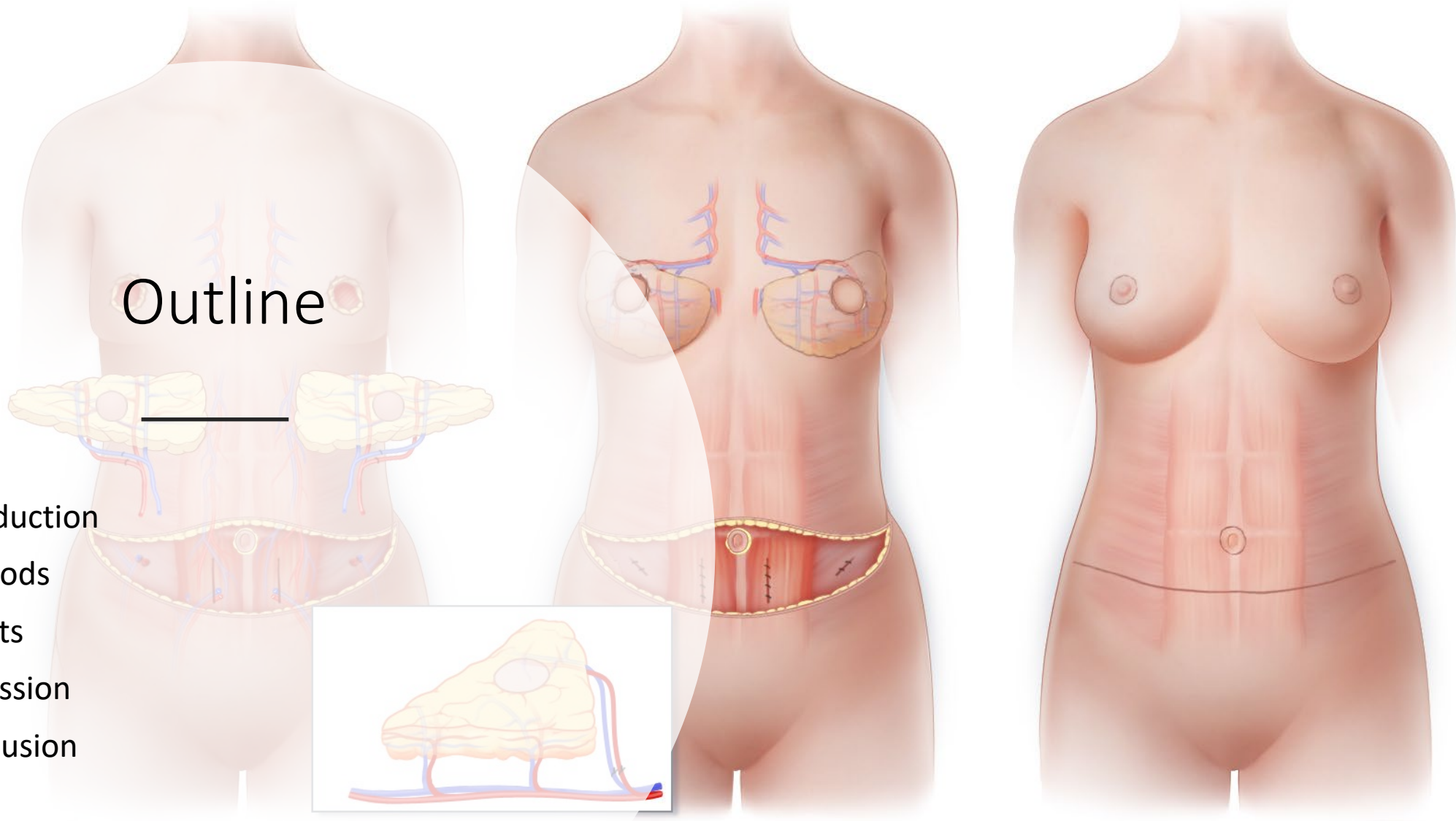
Department of Plastic & Reconstructive Surgery, UT Southwestern Medical Center, Dallas, TX

Spokane Teaching Health

UT Southwestern Medical Center®

Outline

- Introduction
- Methods
- Results
- Discussion
- Conclusion

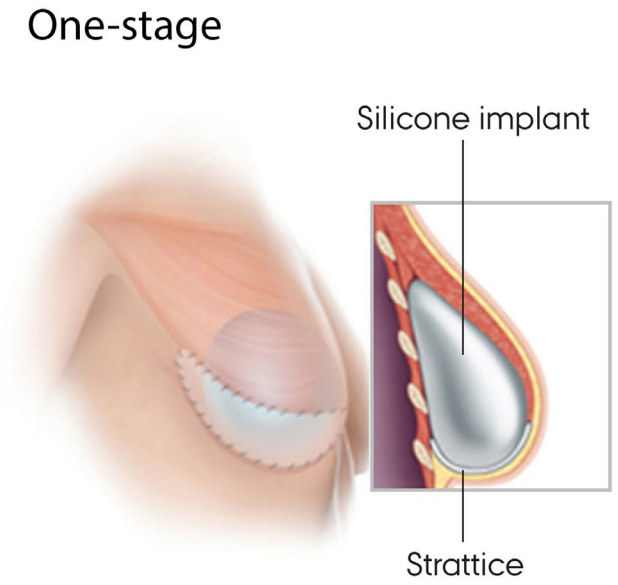


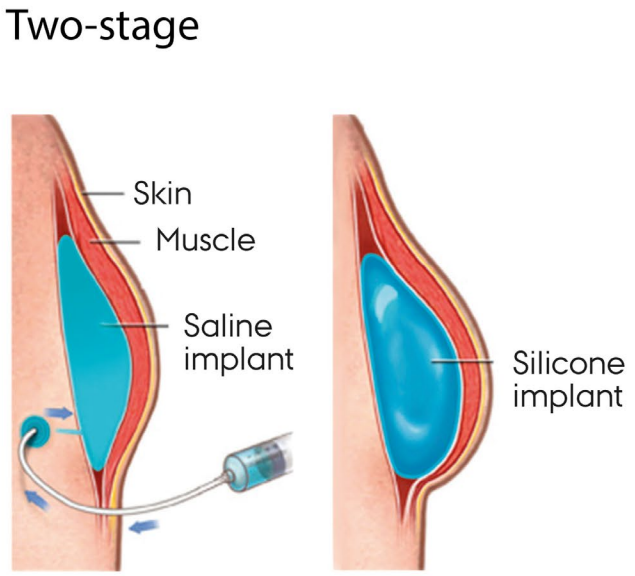
Spokane Teaching Health

UT Southwestern Medical Center®

Introduction

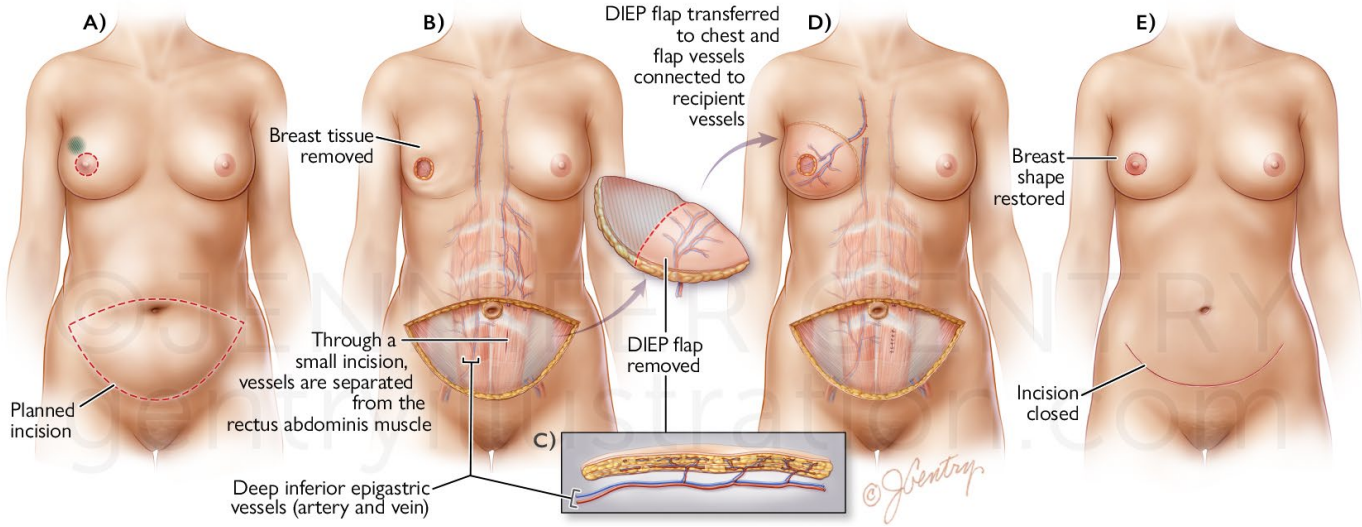
- Between 2000 and 2018, breast reconstruction procedures up 29%
- Implant (delayed) vs Autologous (immediate)
  - Comorbidities
  - BMI
  - Breast size
  - Complication rate
  - Patient preference





Introduction

- Risk factors for post-operative complications:
  - Smoking
  - DM
  - HTN
  - BMI
  - Breast Size (mastectomy weight)
- Most studies associating larger breast size, BMI, with postoperative complications mainly limited to implant-based reconstruction & do not control for BMI



- **Does physical breast size independent of BMI affect post-operative complications?**
- **Are quantitative measures of breast size available preoperatively useful in quantifying risk?**

Spokane Teaching Health

UT Southwestern Medical Center®

Purpose:

To examine the relationship between quantitative breast characteristics and presence of complications in immediate breast reconstruction

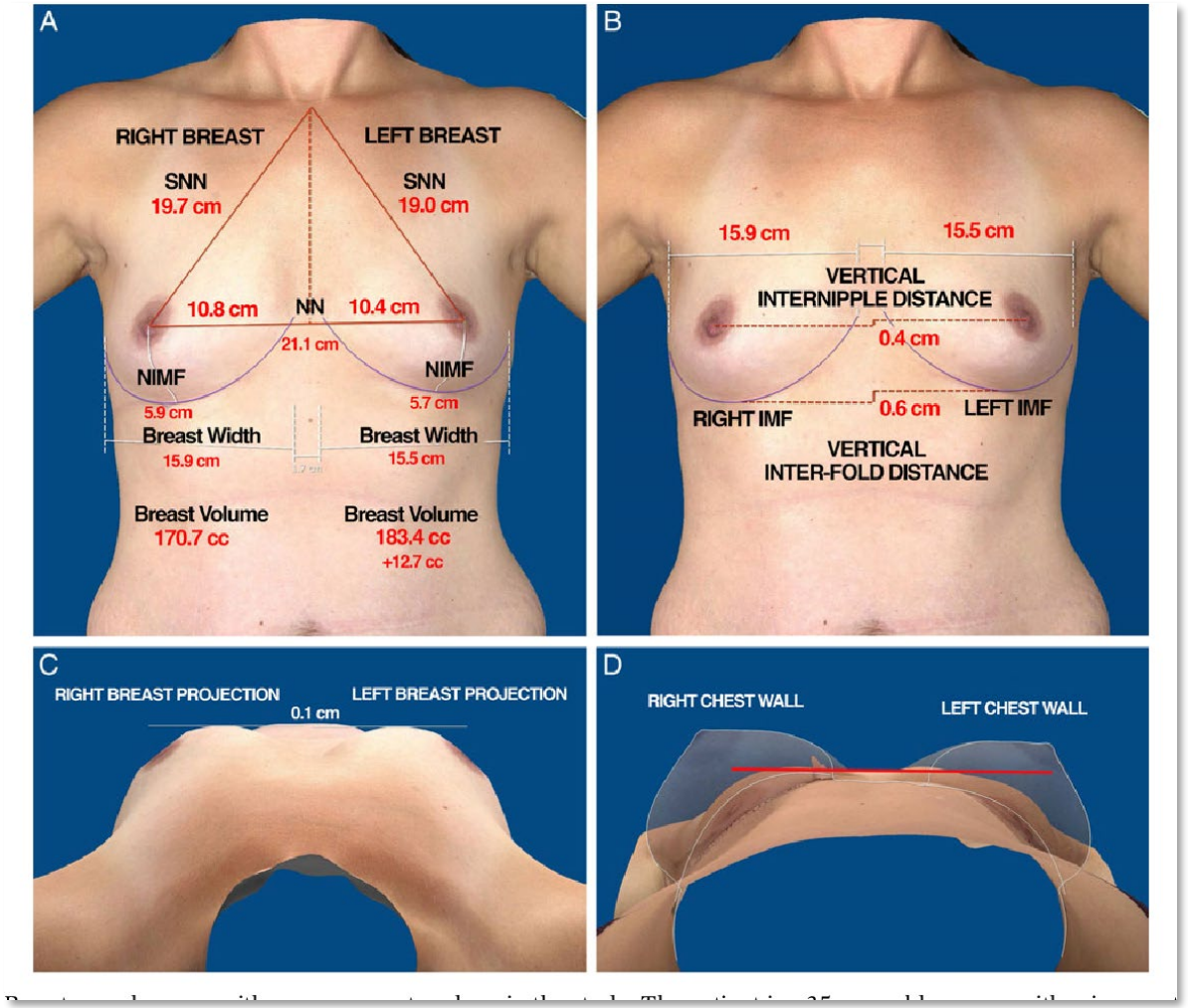
Spokane Teaching Health

UT Southwestern Medical Center®

Methods

Methods

- Retrospective cohort study
- Inclusion criteria:
  - Immediate free-flap reconstruction or tissue expander reconstruction
  - 2012-2018
  - 6 months follow-up data
- Demographic & comorbidities
- Preoperative cup size, ptosis, breast base diameter (BD), nipple to inframammary fold distance (N-IMF), sternal notch to nipple distance (SNN), mastectomy weight



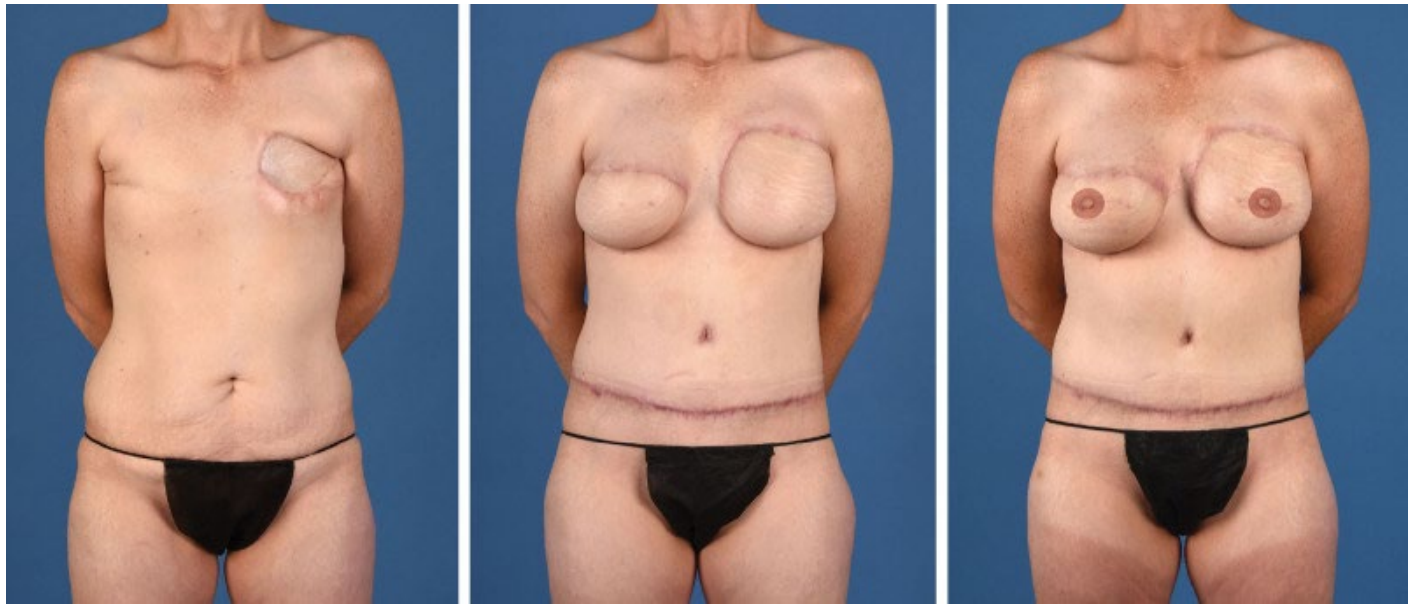
Spokane Teaching Health

UT Southwestern Medical Center®

Methods

- Primary outcome: complications requiring return to OR for treatment
  - I&D secondary to infection
  - Hematoma
  - Seroma
  - Tissue necrosis
  - Wound vacuum placement
  - Dehiscence
  - Flap-specific complications
    - Flap loss, associated complications
  - Tissue expander-specific complications
    - explantation
- Statistics
  - SAS v9.2
  - $p < 0.05$
  - Continuous: t-tests
  - Categorical: χ^2 tests or Fisher's exact test for subgroups with $n < 5$
  - Logistic multivariate regression performed to evaluate independent effects of breast size while controlling for BMI, other comorbidities
  - REDCAP database
- IRB approval obtained at UT Southwestern in Dallas, TX

Results



Spokane Teaching Health

UT Southwestern Medical Center®

Results

- 312 breasts in 170 patients
- 65 (21%) breasts developed re-operative complications

Patient Demographics	
Age (years), mean ± SD	51±9.2
BMI (kg/m2), mean ± SD	29.7±5.4
Comorbidities, count (%)	
Smoking	73 (23.4)
Hypertension	75 (24.0)
Diabetes	25 (8.0)
History of DVT or PE	12 (3.8)
History of Miscarriage	24 (8.7)
Neoadjuvant Chemotherapy	95 (30.4)
Adjuvant Chemotherapy	72 (23.1)
Adjuvant Hormonal Therapy	72 (23.1)
History of Radiation	111 (35.6)
Operative Time (minutes), mean ± SD	295.9 (152.4)
Reconstruction Type	
Immediate Free Flap	55 (17.6)
Immediate Tissue Expander	257 (82.4)
Breast Dimensions	
Ptosis, count (%)	
Grade 0	51 (16.3)
Grade 1	65 (20.8)
Grade 2	142 (45.5)
Grade 3	54 (17.3)
Sternal Notch to Nipple Distance (cm), mean ± SD	26.8± 3.9
Base Diameter (cm), mean ± SD	15.3± 2.5
Nipple to IMF Distance (cm), mean ± SD	10.6± 3.2
Mastectomy Weight (g), mean ± SD	850.5± 385.9
Cup Size, count (%)	
Small	60 (19.2)
Medium	171 (54.8)
Large	81 (26.0)

Spokane Teaching Health

Univariate Analysis

Comorbidities	OR (95% CI)	p-value
Diabetes	1.899 (0.781, 4.619)	0.1574
Smoking Status		
Current	<0.001 (<0.001, >999.999)	0.9723
Former	2.089 (1.143, 3.818)	0.9696
Never	Ref	
HTN*	2.25 (1.246, 4.06)	0.0071
History of DVT/PE*	5.839 (1.789, 19.058)	0.0035
History of Miscarriage*	2.941 (1.292, 6.697)	0.0102
Neoadjuvant Chemotherapy	1.013 (0.56, 1.833)	0.965
Adjuvant Chemotherapy	1.816 (0.992, 3.323)	0.0531
Adjuvant Hormonal Therapy*	2.029 (1.152, 3.575)	0.0144
Radiation History	0.908 (0.511, 1.615)	0.7433
Mastectomy Type		
Areolar-sparing	<0.001 (<0.001, >999.999)	0.9738
Modified Radical	1.708 (0.371, 7.873)	0.9738
Nipple-sparing	0.747 (0.264, 2.116)	0.9664
Radical	<0.001 (<0.001, >999.999)	0.981
Skin-sparing	0.896 (0.434, 1.851)	0.9624
Total (simple)	Ref	
Reconstruction Type		
Immediate Free Flap	1.069 (0.527, 2.169)	0.8536
Immediate Tissue Expander	0.936 (0.461, 1,899)	0.8536

Multivariate

- Significant variables in univariate utilized in MVR
- Repeat MVR performed due to high likelihood of collinearity of mastectomy weight and breast dimensions

	Combined	Ptosis	Sternal Notch to Nipple Distance (cm)	Base Diameter (cm)	Nipple to Inframammary Fold Distance (cm)	Mastectomy Weight (per 100g)	Cup Size
BMI	0.957 (0.883, 1.037)	1.045 (0.985, 1.109)	1.014 (0.946, 1.088)	1.068 (1.009, 1.130)	1.049 (0.992, 1.108)	0.956 (0.888, 1.029)	1.031 (0.972, 1.093)
Age	1.035 (0.996, 1.075)	1.024 (0.989, 1.060)	1.027 (0.992, 1.062)	1.029 (0.995, 1.065)	1.036 (1.001, 1.072)*	1.038 (1.002, 1.076)*	1.029 (0.995, 1.066)
Hypertension	1.826 (0.858, 3.887)	1.627 (0.803, 3.295)	1.702 (0.855, 3.388)	1.695 (0.851, 3.379)	1.490 (0.742, 2.992)	1.879 (0.919, 3.840)	1.613 (0.803, 3.239)
History of DVT/PE	13.524 (2.605, 70.223)*	12.571 (2.990, 52.855)*	11.896 (3.097, 45.703)*	11.597 (3.003, 44.778)*	11.473 (2.854, 46.116)*	13.565 (3.029, 60.754)*	15.029 (3.643, 61.997)*
History of Miscarriage	3.044 (1.088, 8.514)*	2.923 (1.136, 7.522)*	3.007 (1.187, 7.618)*	2.682 (1.066, 6.744)*	2.973 (1.171, 7.547)*	2.569 (0.989, 6.670)	3.078 (1.210, 7.829)*
Adjuvant Chemotherapy	1.479 (0.687, 3.184)	1.674 (0.816, 3.431)	1.478 (0.734, 2.974)	1.530 (0.759, 3.083)	1.575 (0.780, 3.179)	1.455 (0.707, 2.996)	1.569 (0.772, 3.190)
Adjuvant Hormonal Therapy	1.968 (0.902, 4.295)	2.206 (1.073, 4.536)*	2.167 (1.069, 4.393)*	2.071 (1.027, 4.176)*	2.065 (1.025, 4.160)	2.296 (1.103, 4.778)*	2.126 (1.046, 4.322)*
Operative Time	1.001 (0.999, 1.004)	1.002 (1.000, 1.004)	1.001 (0.999, 1.003)	1.002 (1.000, 1.004)	1.002 (1.000, 1.004)	1.002 (0.999, 1.004)	1.002 (1.000, 1.004)
Ptosis							
Grade 0	1.298 (0.311, 5.419)	0.715 (0.246, 2.076)					
Grade 1	0.432 (0.126, 1.478)	0.341 (0.119, 0.978)					
Grade 2	0.389 (0.158 0.961)	0.568 (0.257, 1.257)					
Grade 3	Ref	Ref					
Sternal Notch to Nipple Distance (cm)	0.963 (0.838, 1.105)		1.116 (1.005, 1.240)*				
Base Diameter (cm)	0.855 (0.71, 0.987)*			0.972 (0.857, 1.102)			
Nipple to Inframammary Fold Distance (cm)	1.044 (0.922, 1.182)				**1.116 (1.016, 1.226)***		
Mastectomy Weight (per 100g)	1.315 (1.138, 1.520)*					**1.256 (1.134, 1.392)***	
Cup Size							
Small	Ref						Ref
Medium	2.350 (0.481, 11.491)						5.637 (1.533, 20.723)*
Large	2.406 (0.605, 9.566)						2.949 (0.861, 10.097)

Spokane Teaching Health

UT Southwestern

Multivariate Regression

- SNN Distance
- N-IMF Distance
- Mastectomy Weight
- Medium & Large Cup Size

Discussion

- High BMI, mastectomy weight associated with rates of complications in implant and some flap—based reconstructions
- Mastectomy weight not available preoperatively
- Measurements (N-IMF, SNN, Cup size) can be used as convenient surrogate

- Every 100g mastectomy weight increased odds of return to OR by 31%
- Every 1cm increase in SNN and N-IMF increased odds of operative complications by 12%
- Combining findings with other literature, our results suggest:
  - Breast cup size increases minor complications at C, only increases risk of major complications at DD and above

Discussion

- No relationship between BMI & operative complications
  - More attention to flap thickness, viable skin
  - More excision of non-viable or redundant skin
  - Thinner patients may have thinner mastectomy skin flaps, less fat
- Some suggest complications in larger breasts due to longer op time, higher risk of skin flap necrosis
- None of our MVR found operative time as risk factor

Limitations

- Retrospective
- Selection bias- not all patients had complete information on all preoperative breast dimensions

Conclusions

- Preoperative breast dimensions (SNN, N-IMF, C and above cup size) independently predict postoperative complications after immediate autologous and tissue expander breast reconstruction, regardless of BMI
- Convenient measurements can be used to counsel patients on postoperative complication risk and assist surgeons on finding methods to mitigate and manage complications and expectations

References

1. *2018 Plastic Surgery Statistics Report*.; 2019. https://www.plasticsurgery.org/documents/News/Statistics/2018/reconstructive-procedure-trends-2018.pdf

2. Gabriel A, Sigalove S, Sigalove NM, et al. Effect of Body Mass Index on Outcomes after Prepectoral Breast Reconstruction. *Plast Reconstr Surg*. Published online June 5, 2019:10.1097/PRS.0000000000005901. doi:10.1097/PRS.0000000000005901

3. Chattha A, Bucknor A, Kamali P, et al. Comparison of risk factors and complications in patients by stratified mastectomy weight: An institutional review of 1041 consecutive cases. *J Surg Oncol*. 2017;116(7):811-818. doi:10.1002/jso.24753

4. Duggal CS, Grudziak J, Metcalfe DB, Carlson GW, Losken A. The effects of breast size in unilateral postmastectomy breast reconstruction. *Ann Plast Surg*. 2013;70(5):506-512. doi:10.1097/SAP.0b013e318263f1f8

5. Negenborn VL, Dikmans REG, Bouman MB, et al. Predictors of complications after direct-to-implant breast reconstruction with an acellular dermal matrix from a multicentre randomized clinical trial. *Br J Surg*. 2018;105(10):1305-1312. doi:10.1002/bjs.10865

6. Suga H, Shiraishi T, Tsuji N, Takushima A. Risk Factors for Complications in Expander-Based Breast Reconstruction: Multivariate Analysis in Asian Patients. *Plast Reconstr surgery Glob open*. 2017;5(11):e1563. doi:10.1097/GOX.0000000000001563

7. Francis SH, Ruberg RL, Stevenson KB, et al. Independent risk factors for infection in tissue expander breast reconstruction. *Plast Reconstr Surg*. 2009;124(6):1790-1796. doi:10.1097/PRS.0b013e3181bf80aa

8. Park KU, Weiss A, Rosso K, et al. Use of Mammographic Measurements to Predict Complications After Nipple-Sparing Mastectomy in BRCA Mutation Carriers. *Ann Surg Oncol*. Published online August 9, 2019:1-6. doi:10.1245/s10434-019-07704-1

9. Liu TS, Crisera CA, Festekjian JH, Da Lio AL. Staged Wise-Pattern Skin Excision for Reconstruction of the Large and Ptotic Breast. *Plast Reconstr Surg*. 2010;126(6):1831-1839. doi:10.1097/PRS.0b013e3181f5278f

10. Weissler EH, Lamelas A, Massenburg BB, Taub PJ. Preoperative breast size affects reconstruction status following mastectomy. *Breast J*. 2017;23(6):706-712. doi:10.1111/tbj.12888

11. Khansa I, Hendrick RG, Shore A, Meyerson J, Yang M, Boehmler JH. Breast reconstruction with tissue expanders: implementation of a standardized best-practices protocol to reduce infection rates. *Plast Reconstr Surg*. 2014;134(1):11-18. doi:10.1097/PRS.0000000000000261

12. Yalanis GC, Nag S, Georgek JR, et al. Mastectomy Weight and Tissue Expander Volume Predict Necrosis and Increased Costs Associated with Breast Reconstruction. *Plast Reconstr surgery Glob open*. 2015;3(7):e450. doi:10.1097/GOX.0000000000000408

References

13. Lanier ST, Wang ED, Chen JJ, et al. The effect of acellular dermal matrix use on complication rates in tissue expander/implant breast reconstruction. *Ann Plast Surg*. 2010;64(5):674-678. doi:10.1097/SAP.0b013e3181dba892

14. Freedman AM, Jackson IT. Infections in breast implants. *Infect Dis Clin North Am*. 1989;3(2):275-287. http://www.ncbi.nlm.nih.gov/pubmed/2663982

15. Wang F, Alvarado M, Ewing C, Esserman L, Foster R, Sbitany H. The impact of breast mass on outcomes of total skin-sparing mastectomy and immediate tissue expander-based breast reconstruction. *Plast Reconstr Surg*. 2015;135(3):672-679. doi:10.1097/PRS.0000000000000953

16. Longo B, Farcomeni A, Ferri G, Campanale A, Sorotos M, Santanelli F. The BREAST-V: a unifying predictive formula for volume assessment in small, medium, and large breasts. *Plast Reconstr Surg*. 2013;132(1):1e-7e. doi:10.1097/PRS.0b013e318290f6bd

17. Yuen JC, Coleman CA, Erickson SW. Obesity-related Risk Factors in Implant-based Breast Reconstruction Using AlloDerm. *Plast Reconstr surgery Glob open*. 2017;5(2):e1231. doi:10.1097/GOX.0000000000001231

18. Ehrl D, Heidekrueger PI, Haas EM, et al. Does Cigarette Smoking Harm Microsurgical Free Flap Reconstruction? *J Reconstr Microsurg*. 2018;34(7):492-498. doi:10.1055/s-0038-1639377

19. Prantl L, Moellhoff N, Fritschen U V, et al. Impact of Smoking Status in Free Deep Inferior Epigastric Artery Perforator Flap Breast Reconstruction: A Multicenter Study. *J Reconstr Microsurg*. 2020;36(9):694-702. doi:10.1055/s-0040-1714426

20. Huber KM, Clayman E, Kumar A, Smith P. The Impact of Perioperative Hormonal Therapy for Breast Cancer on Transverse Rectus Abdominis Myocutaneous Flap Abdominal Complications. *Ann Plast Surg*. 2018;80(6S). https://journals.lww.com/annalsplasticsurgery/Fulltext/2018/06006/The_Impact_of_Perioperative_Hormonal_Therapy_for.7.aspx

21. Tran BNN, Ruan QZ, Cohen JB, et al. Does Hormone Therapy Use Increase Perioperative Complications in Abdominally Based Microsurgical Breast Reconstruction? *Plast Reconstr Surg*. 2018;141(6):805e-813e. doi:10.1097/PRS.0000000000004359

22. Parikh RP, Odom EB, Yu L, Colditz GA, Myckatyn TM. Complications and thromboembolic events associated with tamoxifen therapy in patients with breast cancer undergoing microvascular breast reconstruction: a systematic review and meta-analysis. *Breast Cancer Res Treat*. 2017;163(1):1-10. doi:10.1007/s10549-017-4146-3

23. Woo KJ, Paik JM, Mun GH, Pyon JK, Bang SI. Risk Factors for Complications in Immediate Expander–Implant Breast Reconstruction for Non-obese Patients: Impact of Breast Size on Complications. *Aesthetic Plast Surg*. 2016;40(1):71-78. doi:10.1007/s00266-015-0568-7

24. Longo B, Farcomeni A, Ferri G, Campanale A, Sorotos M, Santanelli F. The BREAST-V: a unifying predictive formula for volume assessment in small, medium, and large breasts. *Plast Reconstr Surg*. 2013;132(1):1e-7e. doi:10.1097/PRS.0b013e318290f6bd

Questions?

Thank you

Spokane Teaching Health

UT Southwestern Medical Center®