Shaves off the Cavity or the Specimen (SOCOS) Study: Should Tumor Size Determine Technique?

Jake Prigoff MD, Luona Sun MD, Lisa Wiechmann MD, Bret Taback MD, Roshni Rao MD
Department of Surgery, Breast Surgery Division
New York Presbyterian Columbia University Medical Center, New York, New York

Correspondence can be addressed to jp3672@cumc.columbia.edu

INTRODUCTION

Re-excision for margins after breast conserving surgery (BCS) is a frequent occurrence. Excising a higher volume of tissue is associated with worse cosmetic outcomes. However, studies demonstrate that routine cavity shaving reduces re-excision rates without compromising cosmesis. The surgical technique of margin shaving varies between surgeons. Cavity shaving margin (CSM) removes margins from the lumpectomy cavity edges. Alternatively, specimen shaving margin (SSM) requires ex-vivo removal of margins off the resected specimen by the surgeon. We compared these two distinct intraoperative shaving techniques to evaluate their impact on re-excision rates.

METHODS

Retrospective review identified patients who underwent BCS for DCIS and invasive cancer and received CSM or SSM from 2017 to 2019. Data regarding demographics, pathology, surgical technique, specimen volume, and re-excision was collected. Primary margin (the margin on the initial lumpectomy excision), final shaved margin (margins of the shaved tissues), re-excision rates, and tissue volumes were compared using univariate Chi-Squared analysis and student t-tests.

Table 1. Patient Characteristics

	Cavity Shave Margins (CSM)	Specimen Shave Margin (SSM)	P
N	57	59	
Age	59	62	0.228
BMI	29	28	0.437
Tumor Size	1.84	1.59	0.306
Initial T stage			
Tis	12	12	0.924
T1	34	38	0.437
T2	6	8	0.616
T3	5	1	0.085
Histology			
In-Situ	17	15	0.558
IDC	34	43	0.131
ILC	3	0	0.074
Other	3	0	0.074
ER +	44	48	0.117
PR +	40	41	0.135
Her2 +	30	42	0.288

Table 2. Margin Status and Tissue Volume

	Cavity Shave Margins (CSM)	Specimen Shave Margin (SSM)	P
Final Pathology: N (%)			
DCIS in Final Specimen	42 (73)	45 (76)	0.545
Primary Margin Positive	19 (33)	21 (36)	0.798
DCIS	6	6	
IMC	13	15	
Final Shaved Margin Positive	3 (5)	3 (5)	0.9829
DCIS	1	1	
IMC	2	0	
ADH	0	2	
Tumor in the Shaved Margin	17 (30)	4 (7)	**<0.001**
DCIS	5	3	
IMC	12	1	
Reexcision for Positive Margin	2 (4)	3 (5)	0.676
Volume: Mean cm^3			
Shave Volume	13.4	40.7	**<0.001**
DCIS	9.6	40.9	
IMC	14.7	40.7	
Primary Lumpectomy	120.8	106.1	0.428
DCIS	86.2	119.7	
IMC	133.2	101.5	
Total Volume	134.4	146.8	0.540
DCIS	95.9	160.5	
IMC	147.6	142.2	
Margin Positive Shave Volume	11.7	61.4	0.098
Margin Positive Total Volume	141.2	254.0	0.416

Table 3. Margin Status and Tissue Volume

	CSM	SSM	P
N (number of patients)	13	6	
Tumor Size (cm)	3.92	3.83	0.902
BMI	26.6	32.1	0.213
Final Pathology: N (%)			
Primary Margin Positive	7 (54)	2 (33)	0.370
Final Shaved Margin Positive	1 (7.6)	0	0.684
Tumor in the Shaved Margin	6 (46)	0	0.063
Reexcision for Positive Margin	1 (7.6)	0	0.684
Volume: Mean cm^3			
Shave Volume	11.7	52.5	**0.018**
Primary Lumpectomy	104	196	**0.031**
Total Volume	115.92	248.5	**0.008**

RESULTS

Study Participants

A total of 116 patients met final study criteria. The mean age of this population was 66 years old (range: 27-96). Fifty-seven patients underwent CSM and 59 patients underwent SSM. The mean BMI was similar between the two groups (29 versus 28, P=0.437). The mean tumor size was 1.6cm (range: 0.1-8cm) and distribution of T-stage was also similar between the two groups with the most common being T1 followed by Tis and then larger tumors (**Table 1**). There was also no significant difference between these groups in terms of histologic diagnosis including DCIS, intraductal carcinoma (IDC), or intralobular carcinoma (ILC). There was also no significant difference in hormone receptor status **(Table 1)**. Wire localization was more common in the SSM group (93% versus 42%, P<0.001). Savi scout fiducial reflector (Cianna Medical, South Jordan UT) localization was more common in the CSM group (47% versus 7%, P<0.001).

Rate of Positive Margins

DCIS alone was present in 17 (30%) CSM and 15 (25%) SSM patients. In total, 6 patients (5.6%) had positive final margins. Primary margins were positive in 19 CSM patients, and 21 SSM patients (33% vs.36%, P=0.798). Among CSM, 17 (30%) patients were found to have tumor in the shaved margin specimens, compared to 4 (7%) patients in SSM (P<0.001). The final margin was positive in three CSM due to IDC in two and DCIS in the other and three SSM patients due to DCIS in two and atypical ductal hyperplasia in the other (5% vs. 5%, P=0.983). The re-excision rate for those with positive margins was 100% in the SSM group and 66.7% in the CSM group. This difference was due to a single patient who declined additional re-excision.

When the analysis was limited to those with tumors two centimeters or larger, the rate of primary margin and final margin positivity was not statistically different (**Table 2**).

Specimen Volume

The mean volume of the primary lumpectomy specimen was similar for CSM and SSM groups (120 versus 106 cm^3, p= 0.428). The combined volume of all six shave specimens was higher for the SSM group (40.7 vs 13.4 cm^3, P= <0.001). However, the total volume was similar (146.8 vs 134.4, P=0.428). When evaluating those who's tumors were two centimeters or larger, total volume removed was smaller for the CSM group (115 vs. 248, P=0.008).

CONCLUSIONS

Both CSM and SSM intra-operative techniques demonstrate very low re-excision rates. With larger tumors, CSM achieved a similar rate of negative margins while removing less tissue.

REFERENCES

1. Fisher B, Anderson S, Bryant J, et al. Twenty-Year Follow-up of a Randomized Trial Comparing Total Mastectomy, Lumpectomy, and Lumpectomy plus Irradiation for the Treatment of Invasive Breast Cancer. *N Engl J Med*. 2002;347(16):1233-1241. doi:10.1056/NEJMoa022152
2. Wilke LG, Czechura T, Wang C, et al. Repeat Surgery After Breast Conservation for the Treatment of Stage 0 to II Breast Carcinoma: A Report From the National Cancer Data Base, 2004-2010. *JAMA Surgery*. 2014;149(12):1296-1305. doi:10.1001/jamasurg.2014.926
3. McCahill LE, Single RM, Aiello Bowles EJ, et al. Variability in Reexcision Following Breast Conservation Surgery. *JAMA*. 2012;307(5):467-475. doi:10.1001/jama.2012.43
4. Kobbermann A, Unzeitig A, Xie X-J, et al. Impact of Routine Cavity Shave Margins on Breast Cancer Re-excision Rates. *Annals of Surgical Oncology*. 2011;18(5):1349-1355. doi:10.1245/s10434-010-1420-6
5. Cao D, Lin C, Woo S-H, Vang R, Tsangaris TN, Argani P. Separate cavity margin sampling at the time of initial breast lumpectomy significantly reduces the need for reexcisions. *Am J Surg Pathol*. 2005;29(12):1625-1632. doi:10.1097/01.pas.0000180448.08203.70
6. St John ER, Al-Khudairi R, Ashrafian H, et al. Diagnostic Accuracy of Intraoperative Techniques for Margin Assessment in Breast Cancer Surgery: A Meta-analysis. *Ann Surg*. 2017;265(2):300-310. doi:10.1097/SLA.0000000000001897
7. Corsi F, Sorrentino L, Bonzini M, et al. Cavity Shaving Reduces Involved Margins and Reinterventions Without Increasing Costs in Breast-Conserving Surgery: A Propensity Score-Matched Study. *Ann Surg Oncol*. 2017;24(6):1516-1524. doi:10.1245/s10434-017-5774-x
8. Mook J, Klein R, Kobbermann A, et al. Volume of Excision and Cosmesis with Routine Cavity Shave Margins Technique. *Annals of Surgical Oncology*. 2012;19(3):886-891. doi:10.1245/s10434-011-1982-y
9. Dupont E, Tsangaris T, Garcia-Cantu C, et al. Resection of Cavity Shave Margins in Stage 0-III Breast Cancer Patients Undergoing Breast Conserving Surgery: A Prospective Multicenter Randomized Controlled Trial. *Ann Surg*. July 2019. doi:10.1097/SLA.0000000000003449
10. Moran MS, Schnitt SJ, Giuliano AE, et al. Society of Surgical Oncology-American Society for Radiation Oncology consensus guideline on margins for breast-conserving surgery with whole-breast irradiation in stages I and II invasive breast cancer. *Int J Radiat Oncol Biol Phys*. 2014;88(3):553-564. doi:10.1016/j.ijrobp.2013.11.012
11. Morrow M, Van Zee KJ, Solin LJ, et al. Society of Surgical Oncology-American Society for Radiation Oncology-American Society of Clinical Oncology Consensus Guideline on Margins for Breast-Conserving Surgery With Whole-Breast Irradiation in Ductal Carcinoma in Situ. *Pract Radiat Oncol*. 2016;6(5):287-295. doi:10.1016/j.prro.2016.06.011
12. Dumitru D, Douek M, Benson JR. Novel techniques for intraoperative assessment of margin involvement. *Ecancermedicalscience*. 2018;12:795. doi:10.3332/ecancer.2018.795
13. Aimee Mackey. Is Surgeon's Perception of Margins During Segmentectomy for Breast Cancer Accurate? Quickshot presented at the: American Society of Breast Surgeons; May 5, 2012; Phoenix, Arizona. https://link.springer.com/content/pdf/10.1245%2Fs10434-012-2344-0.pdf.
14. Thill M. MarginProbe: intraoperative margin assessment during breast conserving surgery by using radiofrequency spectroscopy. *Expert Rev Med Devices*. 2013;10(3):301-315. doi:10.1586/erd.13.5
15. Dixon JM, Renshaw L, Young O, et al. Intra-operative assessment of excised breast tumour margins using ClearEdge imaging device. *Eur J Surg Oncol*. 2016;42(12):1834-1840. doi:10.1016/j.ejso.2016.07.141
16. St John ER, Balog J, McKenzie JS, et al. Rapid evaporative ionisation mass spectrometry of electrosurgical vapours for the identification of breast pathology: towards an intelligent knife for breast cancer surgery. *Breast Cancer Res*. 2017;19(1):59. doi:10.1186/s13058-017-0845-2