12:00 PM - 12:05 PM
Surgically Treated Hernia Following Abdominal-Based Autologous Breast Reconstruction: Prevalence, Outcomes, and Expenditures
University of Pennsylvania, Philadelphia, PA, USA
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Introduction: The most feared complication following abdominal-based autologous breast reconstruction is donor-site hernia. We aim to assess the incidence of surgically repaired abdominal hernia in this cohort and secondarily, to identify predictive perioperative factors and estimate the associated healthcare charges.

Methods: Using inpatient and ambulatory surgery data from four states in the U.S., we identified adult women who underwent pedicled transverse rectus abdominis muscle (pTRAM), free transverse rectus abdominis muscle (fTRAM), or deep inferior epigastric perforator (DIEP) flap breast reconstruction between 2008 and 2012. The primary outcome was surgical repair of abdominal hernia within 4 years. Multivariate cox proportional-hazards regression modeling was used to compare outcomes between groups.

Results: The final sample included 8,246 women who underwent pTRAM (29.2%), fTRAM (30.0%), or DIEP (40.8%) breast reconstruction, most often in the delayed setting. The frequency of surgically repaired abdominal hernia following breast reconstruction was highest among the pTRAM group (pTRAM=7.0% vs. fTRAM=5.7% vs. DIEP=1.8%). A hospital encounter for hernia repair, whether inpatient or ambulatory, generated substantial healthcare charges in all groups (pTRAM=$39,704 vs. fTRAM=$48,378 vs. DIEP=$46,481). In multivariate analysis, patients having fTRAM (incidence rate ratio=2.92 [95% confidence interval=2.16-3.94]) and pTRAM (IRR=3.48 [2.60-4.67]) breast reconstruction had a higher incidence of surgically treated abdominal hernia when compared to those having DIEP reconstruction.

Conclusions: Surgically repaired abdominal hernia is common following abdominal-based autologous breast reconstruction and is associated with significant healthcare expenditures. Additionally, we demonstrate that the amount of functional rectus muscle sacrificed correlates to the likelihood of developing a surgically treated abdominal hernia.
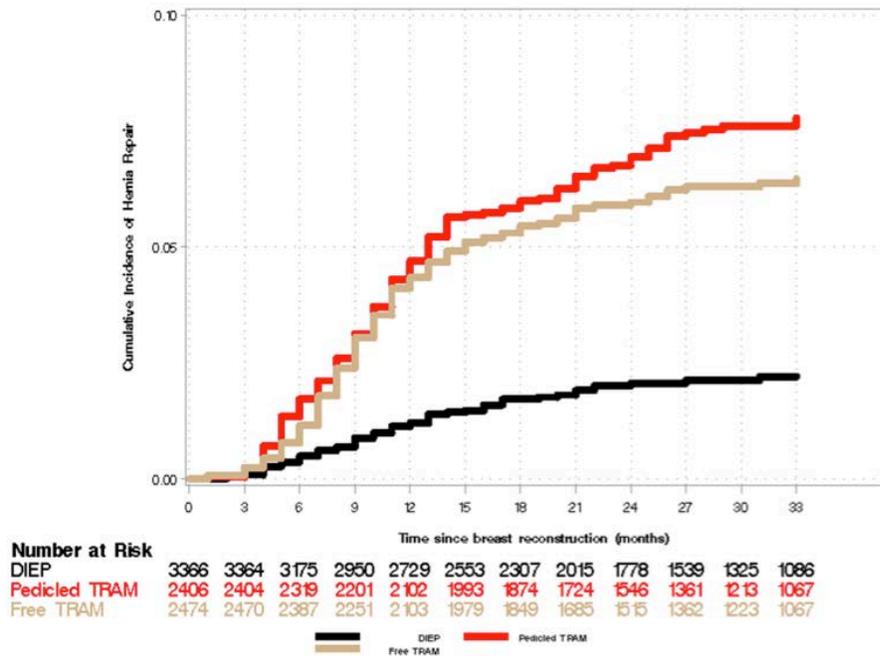
Figure. Kaplan Meier plot depicting hernia free survival after abdominally based breast reconstruction stratified by type of flap (log-rank p value <0.001).

12:05 PM - 12:10 PM

Distance to a plastic surgeon is inversely proportional to rates of post-mastectomy breast reconstruction

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Distance to a plastic surgeon is inversely proportional to rates of post-mastectomy breast reconstruction.

Introduction: The psychosocial benefits of post-mastectomy breast reconstruction are well documented, however, socioeconomic and demographic barriers to reconstruction exist. We evaluated our state-wide patient population to characterize barriers to reconstruction.

Methods: A linked dataset combining North-Carolina-Central-Cancer-Registry (NC-CCR) with administrative claims from Medicare, Medicaid, and private insurance, identified women diagnosed with breast cancer from 2003-2006. Women were included if they received a mastectomy within 6-months of diagnosis, and had continuous insurance enrollment at least 2-years postoperatively (n=5,379). Multivariable logistic regression was used to model odds of receiving reconstruction, adjusting for patient demographics and tumor characteristics.

Results: As the distance to plastic surgeon increased, the likelihood of reconstruction decreased, independent of other previously identified predictors, including age, race, rural location, and lower household income (Table 1). Women with government-funded healthcare (i.e. Medicaid & Medicare) were also significantly less likely to receive reconstruction. Consistent with previous studies, advanced cancer stage, and receipt of radiation decreased the likelihood of reconstruction. Furthermore, when we compared immediate to delayed reconstruction, rural county of residence, chemotherapy, and radiation were significantly associated with delay. (Table2)

Conclusions: This is the first population-based study to demonstrate distance to care, and insurance plan as significant predictors of receipt of reconstruction. Additional research is needed to understand these healthcare barriers, and if the impact of distance to plastic surgeon can be mitigated by outreach programs, including telemedicine, and staged-immediate reconstruction. Current changes regarding coverage and eligibility in the American insurance system, including widespread low-reimbursement coverage may significantly influence access to breast reconstruction.

Table 1: Receipt of any post-mastectomy reconstruction

Variables	Odds Ratio (95% CI)	P-Value
Distance to plastic surgeon		
<10 Miles	1	
10-20 Miles	0.77 (0.63-0.95)	P<0.01
>20 Miles	0.67 (0.53 -0.84	P<0.001
Healthcare Plan		
Private Only	1	
Medicare or Medicare with Private	0.48 (0.37-0.62)	P<0.001
Any Medicaid	0.25 (0.19-0.32)	P<0.001
Rural County		
No	Referent	
Yes	0.69 (0.57-0.84)	P<0.001
Income quartile		
1st	0.71 (0.55-0.96)	P<0.01
2nd	0.73 (0.57-0.94)	P<0.01
3rd	0.87 (0.69-1.09)	p>0.05
4th	1	
Race		
Non-Hispanic White	1	
Other	0.49 (0.38-0.62)	P<0.001
Radiation	1	
No	0.45 (0.36-0.57)	P<0.001
Yes		

Table 2: Receipt of delayed reconstruction (>4 months post-mastectomy)

Variables	Odds Ratio (95% CI)	P-Value
Rural County		
No	1	
Yes	1.61 (1.1-2.36)	P<0.05
Chemotherapy		
No	1	
Yes	2.46 (1.61-3.69	P<0.01
Radiation		
No	1	
Yes	1.56 (1.03-2.35)	P<0.05

12:10 PM - 12:15 PM
The Use of Free and Pedicled Flaps in Oncoplastic Breast Reconstruction

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Introduction

Free flaps have a well-established role in breast reconstruction after mastectomy; however, their role in oncoplastic partial breast reconstruction remains poorly defined. We reviewed our oncoplastic experience and examined factors associated with each type of reconstruction to better understand the indications for free tissue transfer in this setting.

Methods

A retrospective review was performed of all patients undergoing oncoplastic breast reconstruction at a single center between February 2009 and June 2015. The type of reconstruction performed, bra cup size, specimen size, BMI, comorbidities, and complications were examined. Characteristics of patients undergoing volume displacement procedures were compared with those undergoing volume replacement procedures. In the volume replacement group, free flaps were compared with pedicled flaps to further define the variables impacting the choice of technique.

Results

There were 75 oncoplastic reconstructions consisting of 52 reductions/tissue rearrangements (displacement group) and 23 flaps (replacement group). For the displacement group, bra size was D cup or larger in 61% (28/46) and mean BMI = 29. For the replacement group, bra size was B cup or smaller in 67% (14/21) and mean BMI = 24. Fifteen flaps were pedicled thoracodorsal artery perforator (TDAP) flaps and 8 were free flaps. Free flaps included: diagonal upper gracilis (DUG) flaps (n=3), deep inferior epigastric artery perforator (DIEP) flaps (n=2), TDAP flaps (n=2), and profunda artery perforator (PAP) flaps (n=1). Most pedicled flaps (80%) were used for lateral or upper pole defects, while the majority of free flaps (88%) were used for medial and inferior defects or when there was inadequate donor tissue for a pedicled flap (50%). There was one hematoma, one aborted flap and one superficial infection in the pedicled flap group and one superficial cellulitis in the free flap group.

Conclusion

Oncoplastic volume replacement is more common in small-breasted patients with larger defects. The decision to use a pedicled versus a free flap depends on defect size and location, as well as donor tissue availability. Medial defects are particularly difficult to reconstruct using pedicled flaps because of the lack of good medially-based options and because laterally-based options are often hampered by arc of rotation and intervening breast tissue. Free tissue transfer can overcome these barriers. Confirming negative margins prior to oncoplastic flap

procedures avoids the need for reoperation after reconstruction, which could potentially risk loss of the transferred tissue. Judicious use of free flaps for oncoplastic reconstruction can expand the scope of breast conserving therapy.

12:15 PM - 12:18 PM
Discussion

12:18 PM - 12:23 PM
Comparing Multiple Vasodilators in Breast Reconstruction, Is There a Difference?
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Medical Center
BACKGROUND: The use of papaverine to relieve vasospasm and promote vessel dilation is common practice in microsurgery. Likewise, other solutions such as lidocaine and Hong Kong solution have similarly been used for the same purpose. In 2013, there was a national shortage of papaverine. This led to the use of various agents to aid in relief of vasospasm. While these other agents have been accepted as alternatives, no studies to date have measured their direct effects on vessel caliber after topical application. This was the aim of the current study.

METHODS: Five solutions were chosen for this study: heparinized saline, 3% papaverine, 2% lidocaine, 4% lidocaine, and vein solution. The latter is analogous to Hong Kong solution, exchanging verapamil for nicardipine. Patients undergoing immediate or delayed autologous breast reconstruction were chosen. Using a random number generator program, a single solution was assigned to each internal mammary vessel. Immediately following dissection of the vessels, photos were taken using an iPhone. Next, 1 mL of solution was applied to the vessels and photos were again taken at a designated time (5, 10 and 15 minutes). Using GNU Image Manipulation Program (GIMP) and Microsoft Excel, the size of the vessels pre and post treatment were calculated. The percentage increase from baseline was calculated and significance amongst vessel caliber at all 4 time points was determined using repeated measures ANOVA with $p < 0.05$.

RESULTS: Fifty vessels were studied. The average relative increases in vessel diameter 15 minutes following application are as follows: heparinized saline 24%, papaverine 28%, 2% lidocaine 6%, 4% lidocaine 7.3% and vein solution 30.1%. The increase after applying hep saline, papaverine, and vein solution were both clinically and statistically significant ($p<.05$); the increase in vessel diameter at 15 minutes was 0.62 mm, 0.56 mm, and 0.83 mm respectively. Alternatively, the increase in the 2% lidocaine and 4% lidocaine were not clinically (0.13 and 0.20 mm, respectively) or statistically significant ($p<.05$).

CONCLUSIONS: At present, this study suggests that 1 mL of hep saline, 3% papaverine or vein solution applied directly to the vessels and waiting 15 minutes resulted in significant vasodilation. Papaverine and vein solution led to rapid vasodilation, with the greatest increase in caliber of vessels occurring in the first five minutes. Hep saline worked gradually, with the greatest increase occurring between 5 and 10 minutes. Contrarily, 2% and 4% lidocaine do not result in clinically significant vessel dilation.

12:23 PM - 12:28 PM
Nipple-sparing Mastectomy Preserves Nipple but Not Skin Sensation after Long-Term Breast Reconstruction as Quantified by Skin Cutaneous Thresholds
Johns Hopkins Hospital, Baltimore, MD, USA
Emily M. Clarke-Pearson, MD; Nelson G. Rodriguez-Unda, MD; Ricardo Bello, MD, MPH; Abanti Sanyal, MS; Carisa M. Cooney, MPH; Pablo A. Baltodano, MD; Michele A. Manahan, MD; Gedge D. Rosson, MD; Johns Hopkins Hospital

Background: Changes in breast sensation after reconstruction are expected. Some patients experience numbness and anesthesia over the reconstructed breast. Nevertheless, many patients may regain variable sensitivity months or years after the surgery. Return of breast sensation post-reconstruction and whether nipple-sparing mastectomy offers a substantial benefit in terms of sensation is a topic of interest to many patients, but has been inconsistently documented in the published literature. Therefore, we conducted the current study using the Pressure-Specified Sensory Device (PSSD™) to better understand return of sensation after reconstruction and its correlation with patient-reported outcomes.

Methods: After IRB approval, consecutive non-pregnant adult women who underwent nipple-sparing (NSM) and non nipple-sparing mastectomy (NNSM) and were at least 18 months post reconstruction were consented for the study. Breast measurements were taken in 5 different points per breast: The four quadrants (upper lateral, lower lateral, upper medial, lower medial) and nipple. Averaged skin cutaneous thresholds (UL+LL+UM+LM/4) and nipple sensation between NSM and NNSM breasts were compared as the primary outcome measure. A generalized estimating equations model was used; univariate and multivariate variable analysis was done when appropriate. As the secondary outcome, a patient reported outcomes (PRO) questionnaire was used to determine any association between patient's own perception of breast sensation and the type of reconstruction surgery (NSM vs. non-NSM) using multinomial logistic regression accounting for the correlation within patients.

Results: Forty-four patients (74 breasts) were examined for the study (53 NNSM vs. 21 NSM). These groups were further subdivided into autologous vs. implant-based reconstruction. All patients completed the questionnaire. Averaged cutaneous skin thresholds for quadrants were lower for the NSM, 51.8($\pm$ 24.5) grs/mm² vs. NNSM, 56.5($\pm$ 25.7) grs/mm², this difference was not statistically significant. However, NSM offered statistically significant greater sensitivity of the nipple, 44.5($\pm$ 30.8) grs/mm² vs. NNSM nipple, 83.8($\pm$ 27.4) grs/mm² (p<0.001). In a multivariate regression analysis, a predictor of decreased sensation was the number of revision surgeries, especially after third revision. Regarding our secondary outcome, erotic sensation measured in PRO's questionnaire was strongly associated with higher skin sensation.

Conclusions: Breast sensation is decreased after reconstruction in both NSM and NNSM, but nipple sensation is better preserved in NSM breasts. Number of revision surgeries (>3) is a predictor of decreased sensation.

12:28 PM - 12:33 PM
Reconstruction of the Radiated Breast: A National Claims-Based Assessment of Postoperative Morbidity
University of Michigan, Ann Arbor, MI, USA
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Objective: Radiation therapy is an increasingly common adjunct in breast cancer therapy with a potential for untoward effects on breast reconstruction. In recent years, immediate implant reconstruction rates have risen in the radiated patient population in the United States. Concerns

exist over the safety of performing immediate reconstructions in patients who require post-mastectomy radiation therapy. Consequently, the aim of this study is to assess the morbidity associated with various breast reconstruction techniques in radiated patients with a goal of better understanding the optimal approach to reconstruction in these patients.

Methods: Using the MarketScan Commercial Claims and Encounters database, radiated patients who had undergone mastectomy and breast reconstruction from 2009 to 2012 were identified. Only patients with 15 months of continuous enrollment after their index reconstructive procedure were included. Demographic and clinical treatment data were collected. Claims were evaluated for the timing of radiation exposure relative to breast reconstruction. Complications after implant and autologous forms of reconstruction were assessed. A multivariable logistic regression model was developed with postoperative complications as the dependent variable and patient demographics and clinical variables including method and timing of reconstruction as independent variables.

Results: 4,781 patients who met the inclusion criteria were selected for analysis. All patients were radiated, with 1,568 (33%) radiated before and 3,213 (67%) radiated after reconstruction. A majority of the patients (n=3,846, 80%) were reconstructed with implants. Patients with autologous reconstructions constituted 20% (n=935) of the study population. Over 15 months of follow up, the highest overall complication rates were observed in patients undergoing immediate implant reconstruction with subsequent radiation exposure (63%). Failure of reconstruction was the predominant complication in this group of patients (48%). Delayed autologous reconstruction after radiation therapy had the lowest overall complication rate (27%), with a failure rate of 5%. On multivariate logistic regression, radiated patients with autologous reconstructions had significantly lower overall morbidity (OR 0.34, CI 0.28-0.40, $p < 0.001$) relative to similar patients with implant reconstruction.

Conclusions: Immediate implant breast reconstruction with subsequent exposure to radiation therapy, though popular, is associated with significant morbidity. Failures of reconstruction with this approach are close to 50% in the short term, suggesting a possible need to stem the tide that favors this option. Given that autologous reconstruction of the radiated breast results in significantly fewer complications, it is critical that reconstructive surgeons reassess their approach to surgical management in this growing patient population.

12:33 PM - 12:36 PM
Discussion

12:36 PM - 12:41 PM
Changes in Health-Related Quality of Life According to Type and Timing of Breast Reconstruction: A Prospective Cohort Study of 200 Patients with Long-Term Follow-Up
Johns Hopkins University, Baltimore, MD, USA
Ricardo J. Bello, MD, MPH; Chris Devulapalli, MD; Oscar Reyes Gaido; Pablo Baltodano, MD; Nelson Rodriguez Unda, MD; Mohamad Sebai, MBBS; Justin Sacks, MD; Michele Manahan, MD; Carisa Cooney, MPH, CCRP; Gedge D. Rosson, MD; Johns Hopkins University

Introduction: Breast reconstruction rates have risen in the US in the past decade, a trend especially driven by an increase in implant-based reconstructions. Additionally, the use of two-staged reconstructions (delayed immediate) has become popularized, particularly with use of post-mastectomy radiotherapy. Clinical outcomes from different reconstruction modalities have been extensively discussed in the literature. However, preoperative measurements are rarely taken into account. This study aimed to estimate changes in health-related quality of life (HR-QOL) for breast reconstruction patients according to type and timing of reconstruction.

Materials and Methods: In this IRB-approved, prospective cohort study, we followed patients undergoing breast reconstruction between November 2010 and June 2013. We tracked HR-QOL using Breast-Q$^{©}$ preoperatively, after tissue expander placement, and 6 and 12 months after final reconstruction. We extracted clinical information from chart review. We used ANOVA, Kruskal-Wallis test and multiple linear regression to estimate HR-QOL across groups of type and timing of reconstruction.

Results: We included 200 patients in the cohort, of which 75 (37.5%) underwent implant-based reconstruction, 118 (59%) autologous reconstruction, and 7 (3.5%) pure fat grafting. Thirty three (16.5%) reconstructions were immediate, 146 (73%) staged, and 21 (10.5%) delayed. Patients undergoing autologous reconstruction reported a median satisfaction with breasts of 48 preoperatively and 67 at long-term follow-up; whereas patients undergoing implant-based reconstructions scored 58 preoperatively and 65 at long-term follow-up. Autologous reconstructions were significantly associated with larger increases in satisfaction with breasts (p=0.001), compared to implant-based reconstructions, and trended toward higher scores in physical well-being of the chest (p=0.073). Delayed reconstructions were significantly associated with larger increments in satisfaction with breasts (p=0.005), psychosocial well-being (p=0.033), and sexual well-being (p=0.014), compared to immediate reconstructions. Differences in absolute scores achieved at long-term, however, were not statistically significant across timing groups.

Conclusions: Our study shows that patients undergoing autologous and delayed breast reconstructions independently experience a greater increase in HR-QOL, versus implant-based and immediate reconstruction patients. These differences are mainly driven by baseline differences recorded prior to the first consultation and often prior to the determination of autologous versus implant reconstruction, which is such a fascinating finding that it deserves further in depth study.
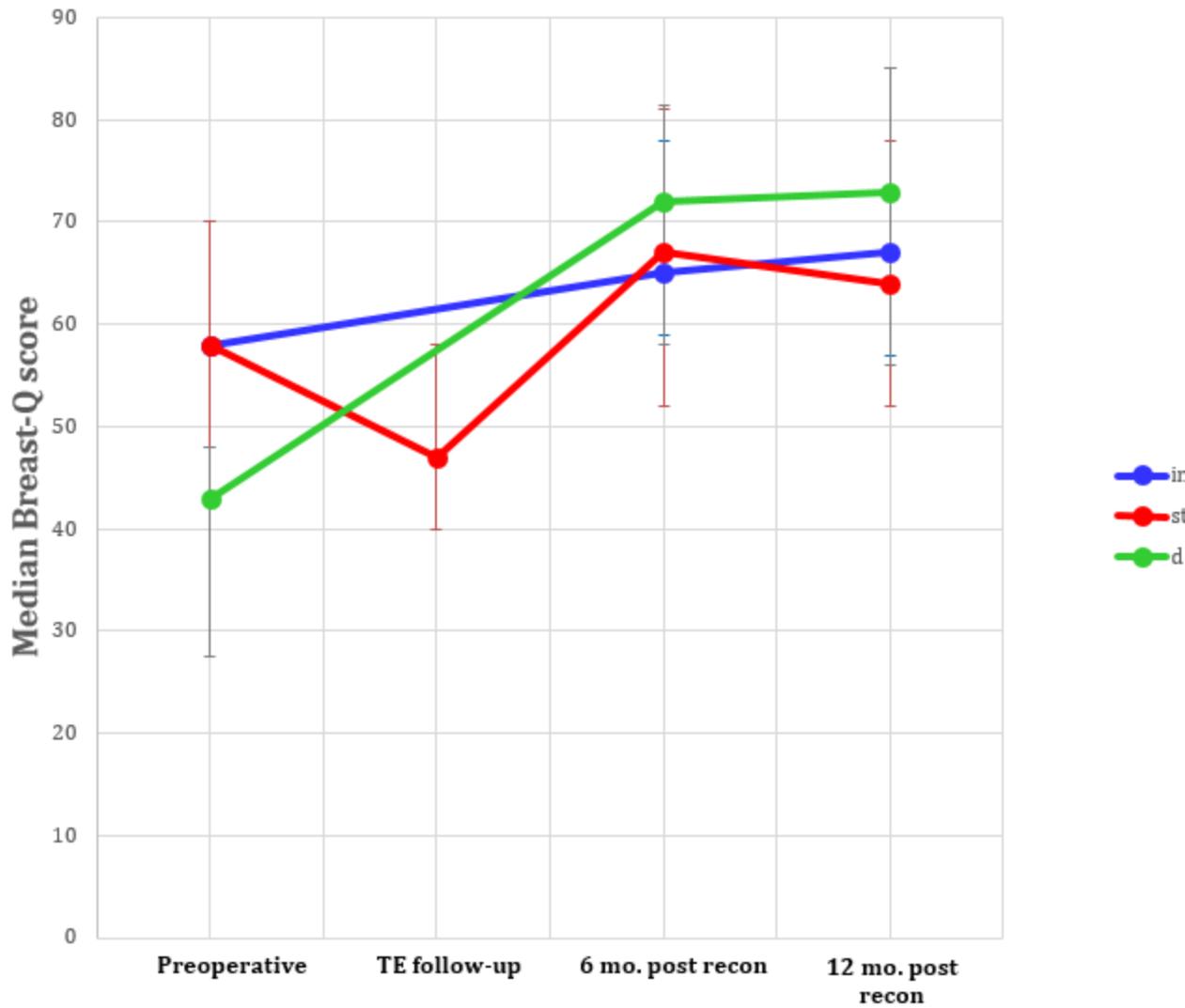
Figure 1. Median <u>Satisfaction with Breasts</u> throughout the breast reconstruction process among patients grouped according to timing
Error bars reflect the interquartile range for the population filling out Breast-Q© at each time point.

Table 1: Results from Multiple Linear Regression for Breast-Q scores Throughout the Breast Reconstructi

| | | Timing | | | |
		Immediate	Staged	Delayed	Imp
Satisfaction with breasts	Mean Difference	0 (Reference)	4.22	22.76	0 (Ref
	95% CI	-	-6.96 to 15.40	7.08 to 38.43	
	p-value	-	0.458	0.005	
Psychosocial well-being	Mean Difference	0 (Reference)	-1.99	13.85	0 (Ref
	95% CI	-	-11.17 to 7.20	1.17 to 26.53	
	p-value	-	0.670	0.033	
Sexual well-being	Mean Difference	0 (Reference)	-1.98	18.66	0 (Ref
	95% CI	-	-12.40 to 8.44	3.83 to 33.49	
	p-value	-	0.708	0.014	
Physical well-being: chest	Mean Difference	0 (Reference)	1.34	6.62	0 (Ref
	95% CI	-	-4.72 to 7.40	-1.88 to 15.11	
	p-value	-	0.663	0.126	

95% CI: 95% Confidence Intervals. All measurements collected using Breast-Q© reconstruction module. All estima

12:41 PM - 12:46 PM

The Effect of Radiation on Quality of Life throughout the Breast Reconstruction Process: A Prospective Cohort Study of 200 Patients with Long-Term Follow-up

Johns Hopkins University, Baltimore, MD, USA
Chris Devulapalli, MD; Ricardo J. Bello, MD, MPH; Emily Moin, BS; James Alsobrooks, BA; Oscar Reyes Gaido; Pablo Baltodano Fallas, MD; Rika Okhuma, MD; Michele A. Manahan, MD; Carisa M. Cooney, MPH, CCRP; Gedge D. Rosson, MD; Johns Hopkins University

Background: Rates of post-mastectomy radiotherapy (PMRT) for locally advanced breast cancer have been rising. Although the risk of increased surgical morbidity from radiation to breast reconstruction has been well established, its effect on health-related quality of life (HR-QOL) has not been extensively studied. The purpose of this study was to determine the effect of post-mastectomy radiotherapy on HR-QOL throughout the breast reconstruction process.

Methods: After obtaining IRB approval, we prospectively consented and followed all patients undergoing breast reconstruction between November 2010 and June 2013. Patient-reported outcomes, using Breast-Q©, were tracked preoperatively, after tissue expanders, and 6 and 12 months after final reconstruction. Paired t-test, Wilcoxon rank sum test, and multiple linear regression analysis were used to determine the effect of post-mastectomy radiotherapy on HR-QOL during the reconstruction process.

Results: Two hundred patients completed 12-month follow-up and were included in the study, of which 51 (25.5%) patients received post-mastectomy radiotherapy and 149 (74.5%) patients did

not. Implant based reconstruction was performed in 75 patients (37.5%), autologous in 118 (59%), and pure fat grafting in 7 (3.5%). Reconstructive modality was not significantly different between irradiated and non-irradiated patients. At long-term follow-up, the no PMRT group reported significantly higher Breast-Q$^{©}$ scores compared to PMRT group in the following domains: satisfaction with breasts (p=0.003), psychosocial wellbeing (p=0.003), sexual wellbeing (p<0.001), physical wellbeing of chest (p=0.024), and satisfaction with outcome (p=0.03). When accounting for baseline QOL by examining Delta Breast-Q$^{©}$ (Long-term Breast-Q$^{©}$ – preoperative Breast-Q$^{©}$), satisfaction with breasts and physical wellbeing of chest significantly worsened in patients requiring PMRT and having implant based reconstruction compared to no PMRT group, but this deterioration was not present among PMRT patients undergoing autologous reconstruction. All patients requiring PMRT significantly worsened in psychosocial wellbeing and sexual well being compared to no PMRT, regardless of reconstruction modality.

Discussion: Post-mastectomy radiotherapy negatively impacts HR-QOL in patients undergoing breast reconstruction at long-term follow-up, particularly psychosocial and sexual wellbeing. Negative effects of PMRT on patient satisfaction are much more pronounced in implant-based reconstructions, and autologous flaps may serve to mitigate this deterioration in satisfaction in patients requiring PMRT.
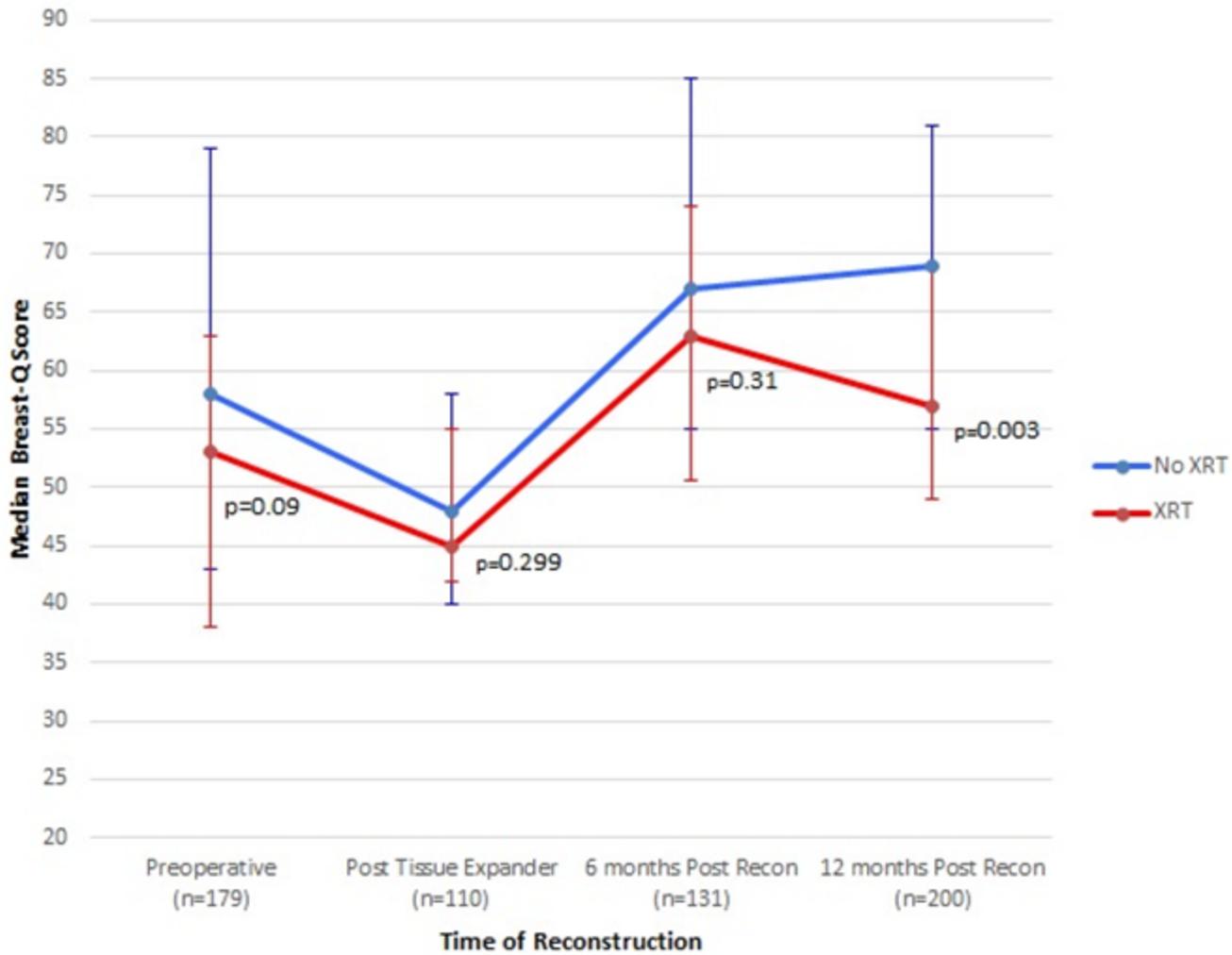
Figure 1. Median <u>Satisfaction with Breasts</u> throughout the breast reconstruction process among irradiated and non-irradiated pat Error bars reflect the interquartile range for the population filling out Breast-Q© at each time point, and p values reflect significa differences between the two groups per Wilcoxon Rank sum test.

Table 1: Unadjusted and Adjusted analysis of Delta BREAST-Q© among reconstructive modalities

		Unadjusted analysis (paired t-test)			
		Satisfaction with breasts	Psychosocial wellbeing	Sexual wellbeing	Physical wellbeing chest
Implant Based Reconstruction (n=75)	No PMRT (n=58)	4.02	6.51	2.36	-1.39
	PMRT (n=17)	-16.71	-9.47	-15.44	-12.88
	P-value	0.013	0.014	0.006	0.004
	95% CI	4.46 to 36.99	3.33 to 28.63	5.38 to 30.21	3.78 to 19.21
Autologous Reconstructions (n=98)	No PMRT (n=74)	12.18	8.11	6.42	0.01
	XRT (n=24)	18.40	-4.16	-7.64	0.12
	P-value	0.304	0.020	0.033	0.977
	95% CI	-18.17 to 5.73	1.96 to 22.57	1.18 to 26.93	-7.54 to 7.33
Overall Population (n=179)	No PMRT (n=137)	7.43	6.90	4.04	-0.72
	PMRT (n=42)	4.19	-6.31	-10.68	-5.14
	P-value	0.535	0.001	0.001	0.106
	95% CI	-7.04 to 13.52	5.34 to 21.07	5.83 to 23.62	-0.95 to 9.80

- Values represent mean Delta BREAST-Q© (Long-Term BREAST-Q© - Preoperative BREAST-Q©). A po
*Variables adjusted for in multiple linear regression analysis were selected based on clinical relevan
**Likelihood ratio tests showed strong evidence for effect modification between XRT exposure and
and physical wellbeing of chest (p-value=0.034), whereas they showed no evidence for effect modi
wellbeing (p-value=0.997). We therefore only present stratum-specific estimates of the effect of XF
significant.

12:46 PM - 12:51 PM
Operative management of locoregional cancer recurrence following post-mastectomy breast reconstruction –indications and outcomes
University of Pennsylvania, Philadelphia, PA, USA

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Purpose: Locoregional recurrence (LRR) of breast cancer is an infrequent, yet unfortunate clinical scenario encountered following mastectomy. Despite the inordinate amount of clinical

outcomes data regarding initial reconstruction of the breast mound, there is meager data to guide operative management of LRR. The purpose of this study is to examine operative outcomes and strategies in the management of local breast cancer recurrence following reconstruction.

Methods: A retrospective chart review was performed on all patients in the health system from 1/1/2000 to 7/1/2014 with an ICD-9 cancer diagnosis and CPT code for oncologic breast resection. Patient charts were then reviewed to identify patients who had previously undergone mastectomy and ultimately experienced LRR. A value of $p<0.05$ was utilized to determine statistical significance.

Results:

A total of 4,569 patients were treated in the health system with the identifying ICD and CPT codes. From this patient cohort, chart review revealed 41 patients who demonstrated LRR following mastectomy. The index reconstruction was as follows 19 (46 percent) TRAM/DIEP, 15 (37 percent) implant, latissimus dorsi/implant 4 (10 percent), and no reconstruction 3 (7 percent). Table 1 demonstrates the means by which the recurrence was found. Two cases of recurrence were found from intraoperative pathology specimens sent during breast reconstruction revisions. The recurrence was detected in the following tissue planes: subcutaneous 11 (27 percent), subcutaneous/pectoralis 10 (24 percent), chest wall 15 (37 percent), and axillary 5 (12 percent). In comparing deep recurrence to superficial (subcutaneous) recurrence, patients had higher rates of mortality (44 versus 18 percent) and metastatic disease at the time of recurrence detection (32 versus 18 percent). Table 2 demonstrates risk factors for requiring a secondary flap after detection of LRR – most notably this included deep recurrence. Table 3 contrasts autologous versus implant reconstruction. Implant reconstruction had a higher rate subcutaneous/pectoralis plane recurrence and a higher likelihood of losing the index reconstruction.

Conclusions: Clinicians must be cognizant of patients' self-exam findings/concerns and should also retain a low threshold for sending specimens to pathology during secondary procedures. Recurrence can be found in multiple planes in relation to the breast reconstruction (Figures 1,2) which differs depending on the type of reconstruction. Notably, the subcutaneous invasion into pectoralis muscle seemingly is predominant in implant reconstruction. Autologous reconstruction was associated with a lower incidence of losing the index reconstruction. Surgical management is dictated by both the index reconstruction and location of recurrence.

Means by which recurrence detected	n (%)
Patient concern	14 (34)
Medical team exam or imaging	10 (24)
Surgical team exam or imaging	11 (27)
Unknown	4 (10)
Revision procedure intraoperative specimen	2 (5)
Biopsy during nipple reconstruction	
Biopsy from capsule specimen	

	Flap after LRR n (%)	No flap LRR n (%)	p value
Total no. patients	15 (42)	21 (58)	
Mean age at surgery	**59.4 (7.6)**	**51.1 (10.3)**	**0.028**
BMI	24.2 (4.02)	27.1 (5.47)	0.144
Time to recurrence/detection	**4.81 (6.17)**	**2.79 (3.14)**	**0.024**
Chemo before LRR	**13 (87)**	**9 (43)**	**0.014**
Chemo after LRR	10 (67)	18 (86)	0.236
Chemo before and LRR	9 (60)	9 (43)	0.310
XRT before LRR	5 (33)	11 (52)	0.257
XRT after LRR	11 (73)	15 (71)	1.00
XRT before and after LRR	4 (27)	7 (33)	0.729
Stage 1,2 vs 3,4	2 (13)	6 (29)	0.424
Metastatic disease at time of LRR	5 (33)	5 (24)	0.529
Subcutaneous recurrence	**1 (7)**	**10 (83)**	**0.011**
Subcutaneous + Pectoralis	5 (33)	4 (19)	0.443
Deep chest wall	**9 (60)**	**6 (29)**	**0.059**
Autologous reconstruction	5 (33)	12 (57)	0.158
2 year survival	13 (87)	18 (86)	1.00

	Implant n (%)	Autologous n (%)	p value
Total no. patients	16 (48)	17 (52)	
Mean age at surgery	52.2 (8)	55.3 (11)	0.368
BMI	24.5 (4.2)	27.7 (5.24)	0.101
Time to recurrence/detection	4.64 (3.81)	3.85 (4.62)	0.264
Chemo before LRR	9 (56)	12 (71)	0.481
Chemo after LRR	12 (75)	13 (76)	1.00
Chemo before and LRR	7 (44)	10 (59)	0.387
XRT before LRR	6 (38)	10 (59)	0.303
XRT after LRR	13 (81)	12 (71)	0.688
XRT before and after LRR	5 (31)	5 (29)	0.805
Stage 1,2 vs 3,4	**1 (6)**	**6 (35)**	**0.041**
Metastatic disease at time of LRR	4 (25)	4 (24)	1.00
Subcutaneous recurrence	4 (25)	7 (41)	0.465
Subcutaneous + Pectoralis*	**7 (58)**	**2 (12)**	**0.014**
Secondary procedure	12 (75)	9 (53)	0.282
Secondary flap	9 (56)	5 (29)	0.481
Loss of index reconstruction	**13 (81)**	**7 (41)**	**0.032**

12:51 PM - 12:56 PM

Incidental Biopsy of Internal Mammary Lymph Nodes during Microsurgical Breast Reconstruction – a Diagnostic Procedure That Potentially Changes Diseases Staging and Therapeutic Plan in Breast Cancer Patients

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Purpose

A complete cancer staging, including nodal status is a crucial step for cancer management. The internal mammary artery and vein are favorable recipient vessels in doing microsurgical breast reconstruction. Although the role of internal mammary lymph node (IMLN) in breast cancer remains controversial, exploration of the internal mammary artery and vein during microsurgical

reconstruction presents a good chance for identifying and sampling the lymph node. Tailored treatments including chemotherapy and local regional radiotherapy in patients with metastasis of IMLN enhance prognosis.

Materials and Methods

A retrospective chart review from Mar 2000 to Dec 2014 was conducted. A total of 524 microsurgical breast reconstructions (238 immediate and 286 delay reconstruction) in 516 patients were performed using the internal mammary artery and vein as recipient vessels. IMLNs were identified in 53 immediate and 42 delay breast reconstructions and sampled during the surgery. The pre-operative mapping of the sentinel lymph nodes (SLN) were reviewed for all the immediate reconstruction patients receiving SLN biopsy during their mastectomy.

Results

Eight out of the 95 lymph nodes were found with cancer metastasis, giving an incidence of internal mammary lymph node metastasis of 8.4% in identified lymph nods and an overall incidence of 1.5%. 53 of the 95 lymph nodes were identified in immediate breast reconstruction with six positive cases (13.2%) while 42 out of 95 were identified from delay breast reconstruction with one positive case (2.4%). One immediate reconstruction patient presented with sentinel lymph node in her IMA, which was sampled successfully during the reconstruction. All of the patients with metastatic IMLNs received local-regional radiotherapy. With the average follow up of 67.3 (3-154) months, all the patients remained alive with 6 disease-free. One patient developed neck lymph node metastasis and one patient developed neck lymph node, bone and liver metastasis.

Conclusion

Breast reconstruction using the internal mammary artery and vein as recipient vessels presented as a good opportunity for sampling the IMLN. Microsurgical breast reconstruction using internal mammary artery and vein as recipient vessels should be considered a reconstructive as well as a diagnostic procedure and all the visible IMLN during recipient vessel preparation should be sampled for pathology. This series addressed the important role of plastic surgeons to help on cancer diagnosis and enhance treatment results.

12:56 PM - 1:00 PM
Discussion