

## **RM94 Breast Reconstruction Completion in the Obese Female: Does Reconstruction Technique Make a Difference in Its Achievement?**

*Wake Forest University Baptist Medical Center, Winston Salem*

Presenter: **Robert Charles Siska, MD**

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### **Background**

Breast reconstruction completion is the goal of the reconstructive process. In normal BMI patients undergoing breast reconstruction, perioperative complication risk is similar between implant-based and autologous reconstruction. This is not the case in the obese female where breast reconstruction operations are associated with increased risk of perioperative complications. We hypothesize that perioperative complications may affect the eventual completion of reconstruction in the obese female. Our aim is to determine if reconstruction technique affects the achievement of reconstruction completion in the obese female.

### **Methods**

An IRB-approved retrospective study of consecutive obese women (BMI  $\geq$  30) who underwent mastectomy and implant-based or autologous reconstruction over a 10-year period was performed. Patient demographics, comorbidities, oncologic treatments, reconstructive procedures and their complications were analyzed.

### **Results**

Two hundred twenty five women with 352 breast reconstructions were included with mean follow-up of 27 months. Seventy-four women underwent 111 autologous breast reconstructions and 151 underwent 241 implant reconstructions. Mean age of included women was 52 years. Mean BMI in the autologous group was 33 and 36 in the implant group. There were no differences between groups in terms of age and presence of medical comorbidities. Active tobacco use was noted in 5.4% of the autologous group and 14.5% of implant patients ( $p=0.47$ ). Chemotherapy, radiation, and delayed reconstruction timing was more common in the autologous patients compared to the implant group ( $p=0.01$ ,  $0.09$ , and  $<0.0001$ , respectively). Minor and major complications occurred more frequently in the implant group compared to the autologous group ( $p=<0.0001$ ). Breast mounds were completed in  $>98\%$  of autologous cases compared to  $76\%$  of implant cases ( $p=<0.001$ ). NAC creation was completed in  $57\%$  of autologous patients and  $33\%$  of implant patients ( $p=0.0009$ ). The rate of successfully completing the breast mound and the NAC is higher in the autologous patient group (Mound OR 3.32, 95% CI 1.36-5.28 and NAC OR 2.7, 95% CI 1.50-4.69) compared to the implant group. Occurrence of a major complication in the implant group decreases the rate of reconstruction completion (OR 13.0, 95% CI 4.9 to 34.1).

### **Conclusion**

Obese women undergoing implant-based breast reconstruction are more likely to have perioperative complications and 24% of these patients fail to achieve mound completion. Obese women who undergo autologous breast reconstruction are more likely to achieve breast reconstruction completion (both mound creation and completion NAC reconstruction) when compared to obese women who undergo implant-based breast reconstruction.

## **RM95 Anatomic Location of Sensory Nerves to the Superior and Inferior Gluteal Artery Perforators Flap: Novel Option for Local and Distant Sensate Autologous Tissue Reconstruction**

*Cleveland Clinic, Cleveland*

Presenter: **Rebecca Knackstedt, MD, PhD**

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### **Background**

The goal of this study was to determine the location of the sensory nerves to the superior and inferior gluteal artery perforator (SGAP and IGAP) flaps. We also aimed to determine if these flaps could be utilized for sensate pressure ulcer reconstruction by utilizing a donor nerve cephalic to the dissection in combination with a nerve graft to stimulate providing sensate reconstruction for a spinal cord injury patient.

### **Methods**

Five bilateral cadaveric dissections were conducted to locate sensory branches to the SGAP and IGAP for a total of 20 flaps. Measurements were made for the entry of the nerve to the flap from the ipsilateral trochanter and posterior superior iliac spine (PSIS).

To simulate sacral pressure ulcer reconstruction, a typical pressure ulcer was created by excising a 7.5cm diameter circle of tissue down to bone over the sacral prominence. Bilateral SGAP flaps were dissected. For a donor nerve, we isolated superior sensory nerves originating from the lumbar plexus in a segmental pattern and performed different levels of coaptations utilizing a nerve graft.

### **Results**

At least one sensory nerve was located in all 20 flaps. For the SGAP, each cadaver had two to four large caliber sensory nerves traveling with a perforator. The sensory nerve was on average 5.9cm (SD 2.8cm, range 1-11.5cm) from the PSIS horizontally, 4.6cm (SD 1.8cm, range 1-7.5cm) from the PSIS vertically, 11.2cm (SD 2.8cm, range 7-16cm) from the trochanter horizontally and 3.1cm (SD 3.0cm, range 0-10cm) from the trochanter vertically. For the ten flaps dissected, one had four sensory nerves, four had three sensory nerves and five had two sensory nerves identified.

For the IGAP, each flap had one or two large caliber sensory nerves traveling with a perforator. The sensory nerve was on average 5.5cm (SD 2.3cm, range 1-10cm) from the PSIS horizontally, 12.2cm (SD 1.4cm, range 9.5-15cm) from the PSIS vertically, 11.3cm (SD 2.8cm, range 6.5-16cm) from the trochanter horizontally and 4.9cm (SD 1.6cm, range 2-8.5cm) from the trochanter vertically .

### **Conclusion**

This is the first study to report on the consistent location of a sensory nerve to the SGAP and IGAP flaps. We also performed a proof of concept cadaveric dissection demonstrating the feasibility of providing local sensate reconstruction. While unanswered questions remain and well-done prospective human studies are required, we hope that this report encourages others to explore the feasibility of considering utilizing these flaps for local or distant sensate reconstruction.

## **RM96 The Septocutaneous Gluteal Artery Perforator (Sc-GAP) Makeover Flap: A Case Series**

*Maastricht University Medical Center, Maastricht*

Presenter: **Ennie Bijkerk, MD**

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### **Background**

The gluteal region is one of the alternative donor sites for autologous breast reconstruction in case that the first choice donor site is not available. The consistent existence of septocutaneous perforators obviates the need for intramuscular dissection of the pedicle. However, this technique requires position changes for flap harvest and inset. Based on the same perforators a flap can be drawn more anteriorly and harvested in supine position: we introduce this flap as the Sc-GAP makeover flap.

### **Methods**

Six patients were eligible for this technique in Maastricht University Medical Center. A horizontal flap is drawn from the anterior superior iliac spine (ASIS) to posterior and the patient is positioned supinely with a cushion under the hip. Dissection starts anteriorly at the level of the fascia of the gluteus medius muscle. The flap is lifted to posterior until the septum between the gluteus maximus and medius muscles is identified and opened. Then the perforators are dissected.

### **Results**

Six patients were successfully operated with 7 Sc-GAP makeover flaps with a mean age of 50 years (range 40-63) and mean BMI of 27,46 (range 24,44-33,46). Indications for the Sc-GAP makeover flap were a previous abdominoplasty (n=1), DIEP procedure (n=3) or when the patient stated they absolutely did not want a scar in the abdomen (n=2). Mean surgery time for unilateral reconstructions was 334 minutes (range 311-319) and for bilateral 581 minutes. Mean flap weight was 717 grams (range 500-1004) with a mean ischemia time of 55 minutes (range 42-63). Mean length of stay in days was 4-6, except for one patient who underwent bilateral reconstruction and was taken back to the theater 3 days post-operative due to flap congestion by a hematoma; she was admitted for 9 days in total (6 days after the last surgery). One patient suffered from persistent seroma at the donor site for 85 days. No further complications were seen and all flaps survived. Projection of the breasts was good, giving a full cleavage.

### **Conclusion**

The Sc-GAP makeover flap is in our opinion the easier and better version of the conventional SGAP flap due to facilitated dissection of the perforators. This flap eliminates the need for position changes in gluteal flap breast reconstruction. Donor site morbidity is minimized, especially with regard to projection of the buttock. The shape and volume of the flap provide good aesthetic outcomes.

## **RM97 Enhanced Recovery after Surgery (ERAS) Pathway Reduces Hospital Stay and Narcotic Use in Microsurgical Breast Reconstruction**

*PRMA Plastic surgery, San Antonio*

Presenter: **Meenakshi Rajan, MD, MS**

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### **Background**

As microsurgical breast reconstruction continues to become more popular, enhanced recovery after surgery (ERAS) pathways strive to restore normal physiological function through the implementation of streamlined protocols. We aim to determine benefits of ERAS pathway implementation in free flap breast reconstruction related to post-operative narcotic use and health-care resource utilization.

### **Methods**

A retrospective analysis of consecutive patients undergoing deep inferior epigastric perforator flap breast reconstruction from Nov 2015 to April 2018 was performed. Our ERAS pathway included preoperative counseling, optimization of nutrition, perioperative fluid management, early mobilization, and multimodal analgesia. Patient age, medical comorbidities, and BMI were recorded preoperatively. Procedural characteristics and immediate postoperative morbidity were recorded along with length of hospitalization. Utilization of narcotics was standardized for the entire hospitalization by determining morphine milligram equivalents.

### **Results**

409 patients met inclusion criteria. The pre-ERAS group comprised 205 patients, while 204 patients were managed via ERAS pathway. Mean age, laterality (unilateral vs. bilateral), timing (immediate vs. delayed) of reconstruction, and number of previous abdominal surgeries were similar ( $p > 0.05$ ) between groups. Mean BMI ( $30.4 \pm 4.8$  vs.  $29 \pm 5.1$ ) and incidence of autoimmune disease (3.9% vs. 0%) were significantly higher ( $p < 0.05$ ) in the pre-ERAS group. Mean operative time (minutes) between both groups ( $450.1 \pm 92.7$  vs.  $440.7 \pm 93.5$ ) was similar ( $p > 0.05$ ). Incidence of vascular thrombosis (6 (2.9%) vs. 5 (2.5%)), hematoma (4 (2%) vs. 4 (2%)), flap loss (1 (0.5%) vs. 4 (2%)), or return to OR for any reason (10 (4.9%) vs. 8 (3.9%)) was similar ( $p > 0.05$ ) between pre-ERAS and ERAS groups, respectively. Mean intra-operative ( $58.9 \pm 32.5$  vs.  $31.7 \pm 23.4$ ) and post-operative ( $129.5 \pm 80.1$  vs.  $90 \pm 93.9$ ) morphine milligram equivalents used were significantly ( $p < 0.001$ ) higher in the pre-ERAS group. Mean length of stay (days) was significantly ( $p < 0.001$ ) longer in the pre-ERAS group ( $4.5 \pm 0.8$  vs.  $3.2 \pm 0.6$ ). Bivariate linear regression analysis demonstrates operative time is positively associated with total narcotic requirements [slope (95% CI)=0.217 (0.114, 0.320)],  $p < 0.001$  and length of stay [slope (95% CI) =0.00177 (0.0008, 0.0028)],  $p < 0.001$ .

### **Conclusion**

ERAS pathways in microsurgical breast reconstruction promote reduction in intraoperative and postoperative narcotic utilization with concomitant decrease in hospital length of stay. In this study, patients managed via ERAS pathways required 46% less intraoperative and 31% less postoperative narcotics with a 29% reduction in hospital length of stay.

## **RM98 The Robodiep: A Case Series**

*MD Anderson Cancer Center, Houston*

Presenter: **Jesse C Selber, MD, MPH**

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**Background:** The evolution of surgical technique in autologous breast reconstruction has improved perfusion reliability while simultaneously decreasing abdominal wall morbidity; however, this progress has plateaued for the open approach because of the length of the fascial incision and degree of muscular dissection required to harvest a reliable flap. The robotic approach to the DIEP represents a method of significantly decreasing disruption of the abdominal wall while maximizing pedicle length.

**Methods:** The authors have recently performed the first 15 robotic DIEP flaps. A description of the indications, imaging analysis, patient selection and details of the surgical technique will be described and shown. Preliminary outcomes related to fascial incision length, post-operative pain, and recovery will be presented.

**Results:** Fifteen flaps were attempted and successfully completed with robotic pedicle harvest. Eleven flaps were unilateral and two were bilateral. There were no flap or abdominal complications. Average robotic time was 52 minutes. Average fascial incision length was 2.7 centimeters (range 1.5 – 6). Average pedicle length was 13 cm. Twelve flaps were single perforator and 3 flaps included 2 perforators. The entire robotic portion of the case including access was completed by plastic surgeons.

**Conclusion:** The RoboDIEP allows maximum pedicle length with minimal disruption of abdominal wall structures, and may be the next logical step in the evolution of minimally invasive, autologous breast reconstruction.



## **RM99 Minimally Invasive Harvest of the DIEP Flap: A Comparison of Endoscopic, Laparoscopic, and Robotic Techniques**

*University of Pennsylvania, Philadelphia*

Presenter: **Sameer Shakir, MD**

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### **Background:**

The evolution of microsurgical breast reconstruction has shifted from flap survival to enhancing aesthetics while simultaneously decreasing donor site morbidity. A major focus of our work has been to develop techniques for minimally invasive harvest of DIEP flaps. We have recently reported the largest series of laparoscopically-harvested DIEP flaps. In the development of this technique we have also performed endoscopic and robotic harvests. The purpose of this study is to compare these methods of minimally invasive DIEP harvest.

### **Methods:**

We performed a retrospective review of all patients presenting to the senior author for minimally invasive harvest of DIEP flap for breast reconstruction from September 2017 until March 2019. Patients were included who underwent either endoscopic, laparoscopic, or robotic harvest. We specifically looked at flap related complications, operative time for flap harvest, total operative time, average fascial incision length, and cost.

### **Results:**

In total, 184 subjects underwent minimally invasive harvest of DIEP flap perforators during the study period. 142 (77%) patients underwent endoscopic, 39 (22%) patients underwent laparoscopic, and 3 (1.6%) patients underwent robotic harvests. There were 2 flap losses in the endoscopic cohort and no flap losses in the other cohort. Flap related complications were similar across all cohorts. Average total flap harvest time was 37 minutes in the endoscopic, 54 minutes in the laparoscopic, and 77 minutes in the robotic cohorts. The total operative time was similar in the laparoscopic and endoscopic groups, however the robotic group had on average an additional 2 hours of operative time. Fascial incision length was decreased significantly in all cohorts, although decreased to the greatest degree in the laparoscopic cohort ( $p<0.05$ ). Compared to traditional harvest, the endoscopic harvest required an additional \$234 per case of disposable cost, the laparoscopic cost was \$495, and the robotic operative cost was \$1,487.

### **Conclusion:**

We present the first single institution study comparing various techniques for minimally invasive harvest of the DIEP flap with the goal to decrease donor site morbidity. Importantly, the fascial injury in all forms of minimally invasive harvest was significantly less than a traditional harvest. There were significant trade-offs in both operative time and cost among the harvest methods. The endoscopic harvest was the cheapest method and also the quickest but resulted in a longer

fascial incision. Robotic harvest was the most costly and time-consuming. We conclude that laparoscopic harvest ideally balances the trade-offs of operative time, cost, and abdominal wall morbidity.

## RM100 Sensate Autologus Breast Reconstruction and Patient Reported Outcomes

*Cleveland Clinic, Cleveland*

Presenter: **Isis Scomacao, MD**

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**Background:** It has been proven that breast reconstruction and improvement of breast sensation for post-mastectomy patients can improve satisfaction and quality of life. Spontaneous sensory recovery after deep inferior epigastric perforator (DIEP) flap has been shown to occur but it is variable and usually poor. The aim of this study is to evaluate patient reported and breast sensory outcomes after utilizing our novel approach to sensate DIEP breast reconstruction with a nerve allograft and conduit.

**Methods:** Sensation recovery tests were performed in all breast quadrants of patients who underwent DIEP reconstruction with (group 1) and without (group 2) neurotization. Patients answered Breast-Q post-operatively. Demographic information, surgical details, and post-operative complications were also analyzed.

**Results:** Total of 74 patients underwent this technique between June/2016 and December/2018. Thirty-eight patients (61 breasts) underwent sensory testing and only these patients were analyzed. Of the 61 breasts, 46 had neurotization (group 1) and 15 did not (group 2). There were no significant differences between groups regarding age, BMI, radiation therapy, timing of reconstruction and in rate of complications. The first sensory test was performed an average of 10 months (SD 5.7months) from surgery for group 1 and 9.6 months (SD 5.5months) from surgery for group 2 ( $p=0.6$ ). Compared to group 2, the neurotized group had better sensation thresholds during the first set of tests for 56% of the total areas evaluated (static and dynamic) ( $p=0.37$ ). On the second round of testing, clinical difference between groups was more evident with improved sensation thresholds observed in the neurotized group for all areas. Neurotized patients had an improvement in 94% of the areas at 16 months post-operatively in comparison with their previous test at 10 months. Only 53% of the areas in the group 2 had better thresholds over time. This difference between the groups was significant ( $p<0.001$ ). The Breast-Q was answered by 92% of the patients. High satisfaction with outcome ( $73\pm 23.3$ ), satisfaction with breast ( $70.6\pm 16.8$ ), chest physical well-being ( $76\pm 12.8$ ), and psychosocial well-being ( $69.9\pm 19$ ) was observed in patients with bilateral breast neurotization.

**Conclusion:** This study demonstrates a positive trend for breast sensation recovery after neurotized DIEP flaps utilizing our approach of coaptation with nerve graft and conduit. Our early results show that patient reported outcomes may also be improved by this increase in return of breast sensation. We will continue to follow these patients as well as recruit further patients to determine the most efficacious means by which to provide sensate reconstruction.

## **RM101 To Stack or Not to Stack: Comparing Reconstructive Outcomes between Stacked/Conjoined and Non-Stacked Unilateral Abdominal Autologous Breast Reconstruction**

*NYU Langone Health, New York*

Presenter: **Ara A. Salibian, MD**

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**Background:** Stacked and conjoined free flaps are increasingly utilized in autologous breast reconstruction to augment volume of tissue transfer. However, there are no comparative studies examining outcomes in stacked versus non-stacked unilateral breast reconstruction with regards to matching native breast size, complications, recovery, and symmetrizing procedures.

**Methods:** A retrospective review of all stacked/conjoined (SC) and non-SC unilateral abdominally-based autologous breast reconstruction was performed from 2011-2018. Variables including demographics, operative characteristics, complications, and revisions were compared.

**Results:** Thirty-six patients with SC-flaps (eight stacked; 28 conjoined) and 107 patients with non-SC-flaps were identified, Average follow-up was 50.1 and 40.3 months, respectively. The SC cohort had a lower BMI (24 versus 28.4,  $p=0.000$ ) and a higher rate of prior breast augmentation (**Table 1**). The SC cohort also had a higher rate of preoperative radiation (52.8% versus 31%,  $p=0.027$ ) and delayed reconstruction (58.3% versus 38.3%,  $p=0.036$ ).

The SC cohort had more DIEP flaps (93% versus 72.9%), and the non-SC group more MS-TRAM flaps (26.2% versus 5.6%,  $p=0.000$ ) (**Table 2**). More perforators were used in the non-SC group (2.3 versus 1.6,  $p=0.000$ ), as well as combined medial and lateral rows (40.2% versus 8.7%,  $p=0.000$ ). Flap weights trended higher than mastectomy weights in the SC cohort, though this was not significant.

Operative time was longer in the SC cohort (7.7 versus 5.9 hours,  $p=0.000$ ), though there was no difference in hospital length-of-stay. The non-SC cohort had a higher rate of clinically-detected fat necrosis (33% vs. 14.3%,  $p=0.043$ ) (**Table 3**). There were otherwise no significant differences in flap, breast or donor site complications. The SC cohort had a lower rate of contralateral breast reduction (8.3% versus 25.2%,  $p=0.034$ ).

**Conclusion:** Patients undergoing unilateral abdominally-based breast reconstruction with stacked/conjoined flaps had lower rates of reported fat necrosis compared to non-stacked/conjoined flaps despite less rectus muscle sacrificed and fewer number of perforators in SC flaps. SC-flap size may be more favorable in certain cases, with a lower rate of contralateral symmetrizing reductions in these patients.

**Table 1. Comparison of patient demographics and oncologic characteristics between stacked/conjoined and non-stacked/conjoined flaps**

	SC	Non-SC	p-value
<b>Patient Demographics</b>			
Patients	36	107	-
Age (years)	53	52.3	0.728
BMI (kg/m <sup>2</sup> )	24	28.4	<b>0.000</b>
Diabetes Mellitus	2 (5.6%)	6 (6.1%)	0.912
Active Tobacco Use	1 (2.9%)	5 (5.1%)	>0.999
Prior Lumpectomy	9 (25%)	23 (23%)	0.808
Prior Breast Augmentation	3 (8.3%)	0	<b>0.018</b>
Prior Breast Reduction	2 (5.6%)	3 (3%)	0.492
Previous Radiation	19 (52.8%)	31 (31%)	<b>0.027</b>
Previous Chemotherapy	13 (36.1%)	37 (36.3%)	>0.999
Postoperative Radiation	0	11 (11%)	0.066
Postoperative Chemotherapy	5 (13.9%)	22 (22%)	0.466
<b>Oncologic Characteristics</b>			
Cancer Stage			0.330
0	4 (15.4%)	17 (18.1%)	
IA/IB	7 (26.9%)	34 (36.2%)	
IIA/IIB	7 (26.9%)	23 (24.5%)	
IIIA/IIIB/IIIC	8 (30.8%)	17 (18.1%)	
IV	0 (0%)	3 (3.2%)	
Mastectomy Type			<b>0.008</b>
MRM	6 (16.7%)	4 (4.1%)	
SSM	21 (58.3%)	78 (79.6%)	
NSM	9 (25%)	16 (16.3%)	
Incision Type*			0.175
Inframammary	0 (0%)	8 (50%)	
Lateral Radial	2 (22.2%)	4 (25%)	
Vertical	6 (66.7%)	2 (12.5%)	
Wise-pattern	1 (11.1%)	2 (12.5%)	
<b>Follow-up Length (months)</b>	50.1	44.3	0.324

SC; Stacked/conjoined; BMI, body mass index; MRM, modified radical mastectomy; SSM, skin-sparing mastectomy; NSM, nipple-sparing mastectomy  
\*NSM patients only.

**Table 2. Comparison of operative characteristics between stacked/conjoined and non-stacked/conjoined flaps**

	SC	Non-SC	p-value
<b>General Reconstruction Characteristics</b>			
Reconstruction Timing			<b>0.036</b>
Immediate	15 (41.7%)	66 (61.7%)	
Delayed	21 (58.3%)	41 (38.3%)	
Flap Type*			<b>0.000</b>
DIEP	67 (93.0%)	78 (72.9%)	
MS-TRAM	4 (5.6%)	28 (26.2%)	
SIEA	1 (1.4%)	1 (0.9%)	
Stacked Type			
Stacked	8 (22.2%)	-	-
Conjoined	28 (77.8%)	-	-
Specimen Weights (g)			
Mastectomy Weight	560.7	715.5	0.097
Flap Weight**	630.1	657.7	0.645
Mastectomy and flap weight difference†	64.4	-71.6	0.063
Number of Attending Surgeons per Case			<b>0.030</b>
One	7 (19.4%)	42 (39.3%)	
Two	29 (80.6%)	65 (60.7%)	
Case Length (hours)	7.7	5.9	<b>0.000</b>
TAP block	5 (14.3%)	50 (46.7%)	<b>0.001</b>
Length of Stay (days)	3.6	3.9	0.358
<b>Flap Characteristics</b>			
Number of Perforators	1.6	2.3	<b>0.000</b>
Perforator Distribution			<b>0.000</b>
Medial	43 (62.3%)	30 (32.6%)	
Lateral	20 (29%)	25 (27.2%)	
Both	6 (8.7%)	37 (40.2%)	
Venous Coupler Size (mm)	2.49	2.65	<b>0.003</b>

SC; Stacked/conjoined; DIEP, deep inferior epigastric artery perforator flap; MS-TRAM; muscle-sparing transverse rectus abdominis myocutaneous flap; SIEA, superficial inferior epigastric artery flap; TAP, transversus abdominis plane

\*Stacked/conjoined flaps analyzed per side/flap; \*\*Combined flap weight in stacked flaps, †Value reported as mastectomy weight subtracted from flap weight.

**Table 3. Comparison of reconstructive outcomes and revisions between stacked/conjoined and non-stacked/conjoined flaps**

	SC	Non-SC	p-value
<b>Flap Complications</b>			
Any flap complication*	2 (2.8%)	3 (2.8%)	0.992
Arterial insufficiency*	1 (1.4%)	1 (0.9%)	0.441
Venous insufficiency*	1 (1.4%)	3 (2.8%)	0.539
Partial flap loss*	1 (1.4%)	1 (0.9%)	0.441
Total flap loss*	0	1 (0.9%)	0.414
Fat necrosis	5 (14.3%)	30 (33%)	<b>0.043</b>
Fat necrosis requiring excision	2 (5.6%)	17 (16%)	0.110
<b>Breast Complications</b>			
Mastectomy Flap Necrosis			
Minor MF Necrosis	2 (5.6%)	5 (5.9%)	>0.999
Major MF Necrosis	1 (2.8%)	7 (8.2%)	0.680
NAC Necrosis**			
Partial NAC necrosis	1 (11.1%)	0 (0%)	0.417
Full NAC necrosis	0 (0%)	2 (14.3%)	0.502
Infection			
Minor Infection	1 (2.8%)	3 (3.5)	>0.999
Major Infection	1 (2.8%)	1 (1.2)	>0.999
Seroma	0	1 (1.2)	0.516
Hematoma	1 (2.8%)	5 (5.8%)	0.479
<b>Donor-site Complications</b>			
Infection			
Minor Infection	1 (4%)	3 (3.6%)	>0.999
Major Infection	1 (4%)	2 (2.4%)	0.546
Seroma	1 (4%)	8 (9.5%)	0.681
Hematoma	0	0	-
Incisional Dehiscence	1 (4%)	11 (13.3%)	0.290
Bulge	1 (4%)	5 (5.9%)	>0.999
<b>Systemic Complications</b>			
DVT/PE	0	3 (3.6%)	0.261
<b>Revision Surgery</b>			
Breast Revision			
Any breast revision	28 (77.8%)	71 (67.6%)	0.250
Total number of revisions	1.1	0.8	0.173
Reconstructed breast revisions	1	0.7	0.143
Contralateral breast revisions	0.9	0.5	0.099
Time to first revision (months)	7	7.4	0.792
Reconstructed Breast			
Fat grafting†	13 (36.1%)	41 (39%)	0.754
Fat grafting amount (cc)	144.81	112.76	0.213
Contralateral Breast			
Breast Reduction	3 (8.3%)	27 (25.2%)	<b>0.034</b>
Reduction Specimen Weight (g)	92	367.7	0.140
Mastopexy	14 (38.9%)	24 (22.3%)	0.079

SC; Stacked/conjoined; MF, mastectomy flap; NAC, nipple-areola complex; DVT, deep vein thrombosis; PE, pulmonary embolism

\*Stacked/conjoined flaps analyzed per side/flap; \*Nipple-sparing mastectomy cases only; †Cases with fat grafting to reconstructed breast only.

## **RM102 Counting the Cost of Failure: The Financial Burden of Flap Loss in Microvascular Breast Reconstruction at a High-Volume Specialist Centre**

*University Health Network, Toronto*

Presenter: **Maleeha Mughal, MBBS MRCS (Eng) MSc FRCS Plast**

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### **Background:**

Although flap failure is an inherent risk of microvascular breast reconstruction the financial implications of this devastating outcome are not well described.

In this study we provide a comprehensive analysis of the additional costs incurred in flap failure and examine the impact on overall costs at a single centre.

### **Methods:**

Patients who underwent microvascular breast reconstruction with DIEP flaps at Toronto General Hospital, University Health Network, Toronto, Canada between January 2009 and June 2018 were included in the study. Clinical details of all total flap failures and their management within 30-days of the initial reconstruction were recorded.

Direct procedural costs for DIEP flap breast reconstructions were derived from an institutional financial database. All costs were converted to US dollars (USD) for comparative purposes.

Standardized cost profiles were created for unilateral and bilateral DIEPs, derived from uncomplicated cases that had an uneventful post-operative course and complied with our streamlined post-operative care pathway as previously described. (O'Neill et al, in press) These costs were extrapolated from institutional financial records and adjusted for timing of reconstruction and date of surgery to account for increases in the cost of individual care components over time. This generated a baseline expected cost for patients undergoing DIEP flap breast reconstruction at our institution.

Costs were individually calculated for each case of flap failure and included the baseline cost of the procedure and all additional costs incurred within 30-days of the index procedure that were directly attributable to flap failure. The total mean cost in flap failure cases were compared to the standardized cost profile (hypothetical mean) for unilateral or bilateral DIEP flaps as appropriate. Costs in each care domain were also compared.

**Results:** Fourteen flap failures occurred in 1369 patients undergoing microvascular breast reconstruction (1%) using deep inferior epigastric artery perforator (DIEP) flaps. The



standardized expected cost of a unilateral reconstruction was \$12,319 but increased to \$23,185 +/- 4,219 when flap failure occurred ( $p = 0.004$ ). A unilateral flap loss in a bilateral reconstruction increased the cost from \$16,837 to \$28,777 +/- 7,186 ( $p = 0.001$ ). Significant increases occurred across multiple financial domains including operating room, supply, post-operative care and laboratory costs.

**Conclusion:** Flap failure significantly increases the cost of a microvascular breast reconstruction. However, as flap failure is a rare event these additional costs have minimal impact on the overall financial burden of a microvascular breast reconstruction service at a high-volume specialist centre.

## RM103 Autologous Vs Implant Breast Reconstruction after Nipple Sparing Mastectomy: Complications, Patient Reported and Aesthetic Outcomes

*Cagri Cakmakoglu, Cleveland*

Presenter: **Cagri Cakmakoglu, MD**

**Cagri Cakmakoglu, MD**(1), Isis Scomacao, MD(1), Joan Lee, BS(2), Thomas Xia, BS(2), Humzah Quereshy, BS(2), Andrea Moreira, MD(3), Risal Djohan, MD(4), Steven Bernard, MD(5), Eliana Duraes, MD(1) and Graham S. Schwarz, MD(1)

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**Background:** Nipple-sparing mastectomy (NSM) is becoming a frequent surgical approach for breast cancer treatment because of its unparalleled cosmetic result. The aim of this study is to compare breast aesthetics, patient satisfaction, and associated complications in patients who underwent NSM with autologous vs implant-based breast reconstruction.

**Methods:** In a quaternary hospital, patients that underwent NSM with autologous and implant-based breast reconstructions had their charts reviewed retrospectively. In addition, they received the post-operative BreastQ and had their post-operative photos evaluated using a multi-parameter breast specific scale. Aesthetic and patient-reported outcomes as well as complication information were analyzed.

**Results:** A total of 501 patients (990 breasts) within the implant group and 121 patients (202 breasts) within the autologous group were evaluated. On the outcome analysis, 221 (44%) of the implant and 84 (70%) of the autologous group had post-operative photos; 144 (29%) of the implant and 45 (37%) of the autologous group answered the BreastQ.

Patient-reported satisfactions with breast and nipple outcomes were statistically, significantly higher within the autologous compared to the implant group. There were no differences in satisfaction with psychosocial, sexual and physical well-being chest scores.

On a multivariate analysis, the negative independent factors influencing breast aesthetics were mastectomy with wise pattern skin incision and radiation therapy; a positive factor was mastectomy with inframammary fold(IMF) incision.

Overall complications were more frequent in the autologous vs implant reconstruction group. During the first 30 postoperative days, the most frequent complications were skin necrosis/delayed wound healing 46 (49%) vs 62 (6.3%), hematoma 4 (4%) vs 28 (2.8%), seroma 3 (3%) vs 27 (2.7%), respectively. Nipple complications in the autologous group constituted 34 (16%). Autologous reconstruction failed in 6% of patients at first attempt. The most common revision procedures were breast scar revision (46%) and skin paddle removal (46%). Reconstruction was clearly completed in 86% of the patients. In the autologous group, nipple-areolar complex reconstruction was performed in 10% of patients due to nipple necrosis. An average of 2.76

surgeries were required to complete the reconstruction. In 12% of patients, reconstruction type was changed due to complications with the most common complication being capsular contracture (36%).

**Conclusion:** For NSM with autologous-based breast reconstruction, a good outcome is positively influenced by IMF incisions, while total nipple necrosis and radiation therapy have a deleterious effect. The use of autologous breast reconstruction has a positive effect on the overall appearance and patient-reported outcomes in the burden of increased rate of complications.

## **RM104 Use of the Vertically-Oriented Profunda Artery Perforator Flap to Capture the Dominant Profunda Artery Perforator**

*Louisiana State University Health Science Center, New Orleans*

Presenter: **Jourdain Artz, MD**

**Jourdain Artz, MD**(1), Clairissa Mulloy, MS(1), Elisa Atamian, MS(2), Jamie Zampell, MD(1) and Hugo St. Hilaire, MD, DDS(3)

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### **Background**

The profunda artery perforator (PAP) flap is a preferred second choice for autologous breast reconstruction when lower abdominal tissue is unavailable due to previous surgery or body habitus. The traditional transverse PAP (TPAP) flap captures the first profunda artery perforator; however, the first perforator is not always dominant. Flap design has evolved to include vertical, oblique, and fleur-de-lis variations; thereby increasing the probability of including the dominant vessel. This study maps the location of dominant profunda perforators and suggests that vertically oriented PAP flap design more commonly captures dominant perforators.

### **Methods**

Profunda perforators were mapped by imaging and cadaver dissection. Twenty MRA or CTA scans (40 thighs) from autologous breast reconstruction candidates were analyzed. Profunda perforator characteristics collected included: distance from gluteal fold, distance posterior to gracilis, length from profunda to muscular fascia, and diameter at profunda take-off and fascial exit. Profunda perforator dissection was performed in 18 cadaveric thighs for correlation. Analysis included mean distance from the pubic tubercle (anatomically equivalent to gluteal fold), distance posterior to gracilis, diameter at fascial exit, and number of perforators.

### **Results**

Imaging analysis demonstrated 128 perforators total, with mean of 3.2 perforators per thigh. Mean distance of perforator fascial exit distal to the gluteal fold was 64.6 mm (range: 9.0-185.0mm). The dominant perforator, as identified by largest perforator diameter at fascial exit, occurred on average, 56.2mm distal to the gluteal crease. Correlational cadaveric studies analyzed 18 thighs for a total of 45 perforators, with mean of 2.5 perforators per thigh. Mean distance of perforator fascial exit distal to the pubic tubercle was 101.5mm (range: 35.0-160.0mm). Mean distance of the dominant perforator distal to the pubic tubercle was 101.7mm (range:). The dominant perforator was on average 2.5mm in diameter at fascial exit. 75% of dominant perforators were identified exiting below 8cm distal to the pubis and missed by TPAP flap design.

### **Conclusion**

This study shows the dominant profunda perforator commonly exits near the inferior border of the traditional TPAP design. The vertically oriented PAP, disguised in the inner thigh like a

vertically oriented medial thigh lift, incorporates multiple perforators with reliably long pedicle length and excellent vessel diameter for easy dissection and recipient site anastomosis. These findings serve to broaden the application of VPAP flap use for autologous reconstruction based on profunda anatomy.

## RM105 National Trends in Hospitalization Charges for Autologous Free Flap Breast Reconstruction

Case Western Reserve University, Cleveland Heights

Presenter: **Yida Cai, BA**

**Yida Cai, BA**, Samuel Boas, BS, Lesley E Summerville, BS, ScM and Anand Kumar, MD  
Case Western Reserve University, Cleveland, OH

**Background:** There exists significant cost variation among patients undergoing autologous free flap breast reconstruction. Previous studies have hypothesized that factors like length of stay and hospital volume are key factors driving the variation of cost associated with these procedures, however changes in these factors and cost over multiple years have not been studied. Our study analyzes the factors influencing hospital charges relating to autologous free flap breast reconstruction and their trends over multiple years.

**Methods:** The Healthcare Cost and Utilization Project's National Inpatient Sample database was analyzed via secondary cross-sectional analysis from January 2009 to December 2014. All female patients who were diagnosed with breast cancer or at a high risk for breast cancer who underwent autologous free flap breast reconstruction were included.

Variables of interest included demographic data, hospital characteristics, hospitalization data and total hospital charges. All charges were inflated to May 2019 value. Univariate and generalized linear models were used to examine associations between various factors of interest and the final adjusted charge associated with each hospitalization as well as trends in these factors over the years.

**Results:** 659,220 female patients were diagnosed with breast cancer or had a high risk of breast cancer during hospitalization between 2009 and 2014. Of these patients, 20,050 (3.0%) received autologous free flap breast reconstruction and were included in the study. The mean total hospital charge for these patients was \$84,593.41 (interquartile range: \$56,616.24 – \$125,088.72). Regression analysis showed that the proportion of procedures to the total population of potential patients significantly increased over the years ( $p = 0.02$ ). The average total charges also increased significantly ( $p < 0.01$ ), despite an overall decrease in length of stay ( $p = 0.05$ ). Procedures performed in the West were associated with significantly higher charges when compared to other regions (\$147,855.42).

**Conclusion:** The overall demand for the autologous free flap breast reconstruction appears to be increasing within the patient population, in conjunction with increasing associated hospital charges. This increase in cost is seen despite an overall decrease in length of stay, originally thought to be the main contributor to regional cost variation. Further studies will be done to develop strategies to better target increased hospitalization charges, as the overall healthcare burden of this procedure is expected to rise if current trends continue.

Abstract Figure: [Google Drive Link](#)

## RM106 The Predictive Value of Caprini Score Vs. Timing of Perioperative Anticoagulation on the Outcome of Microsurgical Breast Reconstruction

Albany Medical Center, Albany

Presenter: **Paschalia M Mountziaris, MD, PhD**

**Paschalia M Mountziaris, MD, PhD**(1,2), Christina Rudolph, MD(1), Maxwell Sandberg, BS, MS(1), Brittany Nguyen, MD(1), Ashit Patel, MBChB(1), Kristen M Rezak, MD(3) and Joseph A Ricci, MD(1)

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Caprini	LMWH	VTE	Flap Loss	Wound Infection	Hematoma	Blood Transfusion	Unplanned Return to OR
High	Immediate	0%	0%	25%	4%	54%	4%
	Later	0%	15%	31%	15%	69%	23%
Low	Immediate	1%	6%	26%	3%	63%	7%
	Later	3%	3%	33%	7%	56%	5%

**Background** Venous thromboembolism (VTE) risk is inherently high in autologous breast reconstruction patients, due to procedure length, prolonged immobility, and patient comorbidities. Recent guidelines favor early administration of low-molecular weight heparin (LMWH) for VTE prophylaxis. We previously compared immediate and later LMWH administration in terms of VTE incidence and flap outcomes, finding evidence to support immediate postoperative administration. Individual VTE risk can be estimated using the Caprini score. We hypothesized that our prior findings regarding timing of VTE prophylaxis administration would interact with the Caprini score to predict negative surgical outcomes, particularly VTE incidence.

**Methods** A retrospective review was performed of all microsurgical breast reconstruction patients between 2011-2017. Patient care followed an established postoperative protocol, with the exception of postoperative LMWH administration, given either immediately (“Immediate”), or the following morning (“Later”). Patients were further sub-grouped into a low (<8) and a high (>=8) Caprini score.

**Results** 290 free flaps were performed in 185 patients. 111 received LMWH within 8 hours, and 74 received LMWH 8-24 hours postoperatively. There were no significant differences amongst the groups in terms of demographics. However, there were twice as many patients with VTE in the “Later” group, as well as increased incidence of wound infections and flap loss. When these two groups were further divided according to Caprini score, high Caprini score (>=8) combined with “Later” LMWH administration showed a trend for increased flap loss, wound infection, likelihood of returning to the operating room, and clinically significant bleeding. For low Caprini score, “Later” LMWH administration showed a trend for three-fold increase in VTE incidence (Table 1). Due to the small number of complications, none of these differences were statistically significant.

**Conclusion** In microsurgical breast reconstruction, there is an ongoing discussion regarding the optimal timing of VTE prophylaxis, due to concerns about bleeding risk. Our results suggest that patients at higher risk for VTE, identified using the Caprini score, have an increased likelihood of poor flap outcomes if postoperative LMWH administration is delayed. However, regardless of Caprini score, immediate LMWH administration can decrease VTE risk without increasing clinically significant bleeding. This information can help further refine existing evidence-based guidelines and improve surgical outcomes and patient safety.



## **RM107 Preoperative Identification and Clinical Use of an Obturator Artery Variant in Deep Inferior Epigastric Artery Perforator Flap Breast Reconstruction**

*Virginia Commonwealth University Health System, Richmond*

Presenter: **Jeremy Powers, MD**

**Jeremy Powers, MD**, Katherine Reuter, BS, Shuhao Zhang, MD and Santosh Kale, MD, MBA  
Virginia Commonwealth University, Richmond, VA

### **Background**

The objective of this study is to quantify the prevalence of a vascular anatomic variant in which the obturator artery (OA) branches from the deep inferior epigastric artery (DIEA) in autologous breast reconstruction candidates and document its clinical application. Typically, the OA arises from the internal iliac artery and exits the pelvis through the obturator canal. When the OA originates from the DIEA, it may be utilized in a “flow-through” fashion to direct antegrade internal mammary artery (IMA) flow into a second free flap in dual-pedicle or stacked flap autologous breast reconstructions.

### **Methods**

Pre-operatively obtained abdomen/pelvis CTA images of 120 autologous breast reconstruction patients were retrospectively reviewed and assessed for the presence of the obturator branch arising from the DIEA. Anatomic characteristics/laterality were documented and descriptive statistics were completed. Recent case records were reviewed and five patients were identified in whom the obturator branch was used.

### **Results**

Our analysis revealed 60 of the 120 (50.0%) breast reconstruction candidates to have the OA arising from a common trunk with the DIEA. The variant presented bilaterally in 27 (22.5%) patients and unilaterally in 33 (27.5%). Of the unilateral variants, 12 (36.4%) patients demonstrated right-sided laterality, while 21 (63.6%) patients demonstrated left-sided laterality. The OA variant has been used in four cases of unilateral stacked DIEP flap breast reconstruction and one case of an extended hemi-abdominal single perforator DIEP flap with the SIEA supercharged to the OA branch. There were no flap complications in these patients.

### **Conclusion**

The OA arises from a common trunk with the DIEA in half of our breast reconstruction cohort. Importantly, utilizing this OA variant in stacked flap reconstructions allows for antegrade flow to both flaps, potentially optimizing perfusion by avoiding use of reduced retrograde IMA flow for the second flap. Additionally, the OA variant is an ideal size match with the DIEA, contributing to its ease of use compared to the DIEA lateral/medial row which would otherwise be required for flow-through anastomosis. While more research is required, our early results demonstrate that the OA branch is fairly common and may be a useful tool for the breast microsurgeon.

## **RM108 Is a CTA for Autologous Breast Reconstruction Worth It?-- Lessons from a Blinded, Prospective, Controlled Study**

*Austin Hembd, DALLAS*

Presenter: **Austin Hembd, M.D.**

**Austin Hembd, M.D.**(1), Danielle Dumestre, M.D.(2), Sumeet S. Teotia, M.D.(1) and Nicholas T. Haddock, MD(1)

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**Background:** Perforator selection in DIEP flap breast reconstruction is often guided by preoperative imaging modalities such as a CT-angiogram. However, in the context of rising health care costs and changing reimbursement, the debate of whether a CTA truly reduces operative durations, and is thus worth the costs, time, or morbidity associated has never been more pertinent.

Previous studies comparing operative times with and without CTA use exists, albeit with inconsistent conclusions. In aims of reducing the inherent variability and biases involved with retrospectively comparing total operative durations, this prospective study aims to investigate whether CT-angiograms reduce durations of specific operative sequences involved solely in flap harvest.

**Methods:** A controlled, blinded, prospective study from June 2018 to March 2019 was conducted on patients undergoing DIEP flap breast reconstruction with preoperative CTA imaging. Utilizing a two-surgeon model, patients were assigned to two groups: the experimental group included flaps harvested by a surgeon-led team that was blinded to the CTA, while the control group included flaps harvested by a surgeon-led team that reviewed the CTA preoperatively. The blinded surgeon was randomly assigned and alternated. Intraoperative timing was recorded and compared between each group for initial perforator identification, perforator selection, and total flap harvest. Perforator selection characteristics were compared between what was selected by the blinded surgeon and the “ideal” perforator selected by the other, control surgeon. Statistical analysis was done with paired t-tests. Flaps harvested without a resident were excluded.

**Results:** 27 flaps were included in the blinded group and 33 were included in the control group that reviewed the CTA. The mean time to first perforator identification was longer in the blinded group vs. the non-blinded group [28.6 minutes vs. 17.8 minutes,  $p<0.0001$ ]. Time to perforator decision-making was also longer in the blinded group vs. the non-blinded group [23.1 minutes vs. 5.6 minutes,  $p<0.0001$ ]. Time from skin incision to complete harvest of the flap was significantly longer in the blinded group vs. the non-blinded group [128 min vs. 80 min,  $p<0.0001$ ].

Significantly more perforators were included in the blinded flaps compared to the non-blinded flaps (2.3 vs. 1.4 non-blinded,  $p<0.001$ ). There were no significant differences in flap weight, BMI, or surgical history between each group.

**Conclusion:** These results suggest preoperative CT-angiograms can significantly reduce operative sequence durations specifically pertinent to flap harvest. In addition, the confidence afforded by the CTA-guided selection may reduce the perforators harvested, potentially avoiding increased abdominal morbidity.

**RM109 The Impact of Radiotherapy on Long-Term Satisfaction and Health Related Quality of Life in Post-Mastectomy Breast Reconstruction – an Analysis of 3,265 Patients**  
*Memorial Sloan Kettering Cancer Center , New York*

Presenter: **Thais Polanco, MD**

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### **Background**

This study aims to assess the effects of radiation therapy (XRT) on long-term satisfaction and health related-quality of life in patients undergoing post-mastectomy, implant-based (IBR) or autologous breast reconstruction (ABR).

### **Methods**

BREAST-Q scores for women who underwent IBR or ABR at a tertiary academic cancer center were prospectively collected from 2010 – 2017 as part of routine care. Mean scores for satisfaction with breasts, outcome, and physical well-being of the chest were examined by XRT status, timing, and reconstructive modality preoperatively and at years 1-5 using non-parametric analyses and regression analyses.

### **Results**

Of 3,265 included patients, 867 patients underwent XRT. XRT patients at preoperative timepoints or postoperatively scored significantly lower than non-XRT patients ( $p < 0.01$ );

Patients with XRT had lower physical well-being scores compared to patients without XRT at

each postoperative time-point (years 1-5). ABR patients with XRT had higher breast satisfaction scores than IBR with XRT ( $p < 0.01$ ).

## **Conclusion**

Largest prospective examination on effects of XRT on PRO in breast reconstruction patients utilizing the BREAST-Q to date. XRT adversely impacts long-term postoperative breast satisfaction and physical well-being of the chest. Timing of XRT to TE or implant did not significantly effect breast satisfaction and physical wellbeing in IBR patients. This data can improve preoperative counseling for modality decision making, informed consent, and expectation management in patients undergoing breast reconstruction in the setting of XRT.