METHODS: Female Lewis rats were grouped (n = 7/group): expander without XRT (Control); expander + XRT (XRT); and expander + AMF + XRT (AMF). Expanders were surgically placed in a submusculocutaneous plane on the dorsum of the animal and filled to achieve a final volume of 15 ml. Both the XRT and AMF group received a total XRT dose of 35 Gy. The AMF group received AMF pretreatment 30 minutes before XRT. After a 20-day recovery period, tissues overlying the expander were harvested and sectioned. Raman spectroscopy was performed to study the chemical properties of dermal type I collagen.

RESULTS: Based on the $(853 + 877)/1,657 \text{ cm}^{-1}$ band intensity ratio (Pro+Hyp/Amide-I ratio), collagen turnover was impaired in expanded, irradiated tissues (mean ratio, 0.492; SD, 0.086) compared to the control group (mean ratio, 0.660; SD, 0.089). This impaired collagen synthesis was not observed in animals receiving AMF pretreatment (mean ratio, 0.685; SD, 0.098), supporting its efficacy as a radioprotectant. Additionally, based on the $853/877 \text{ cm}^{-1}$ band intensity ratio (Hyp/Pro ratio), the hydroxylation of proline within collagen was reduced in expanded, irradiated tissues compared to controls. This decrease in the Hyp/Pro ratio was paralleled and supported by the observed reduction in collagen synthesis (Pro+Hyp/Amide-I ratio). This reduction in hydroxylation of collagen proline was mitigated by AMF pretreatment. The $1,656/1,673 \text{ cm}^{-1}$ intensity ratio ($\alpha$-helix/$\beta$-sheet ratio) was evaluated to detect changes in collagen secondary structure, and interestingly, no significant changes in the $\alpha$-helix/$\beta$-sheet ratio were found between irradiated and non–irradiated-expanded tissues. These results suggest that radiotherapy reduces collagen synthesis, but the integrity of collagen secondary structure is preserved.

CONCLUSION: This study further elucidated the mechanism of dermal type I collagen radiation injury. Pathologic changes in the chemical composition of irradiated tissues were detected utilizing Raman spectroscopy. Radiation significantly impaired collagen synthesis, resulting in a marked reduction in the collagen content of irradiated tissues. Amifostine was shown to mitigate these detrimental effects, as AMF pretreatment demonstrated a significant preservation in type I collagen synthesis in this model of irradiated expander-based breast reconstruction. Utilizing AMF as a prophylactic radioprotectant in breast cancer patients has the potential to increase reconstructive options available to patients and their plastic surgeons and improve surgical outcomes in the aftermath of radiotherapy.

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**BACKGROUND:** There has been a steady evolution over the past few decades in postmastectomy breast reconstruction techniques. Nipple-sparing mastectomy approaches combined with immediate reconstruction can provide excellent cosmetic outcomes for women, but absent or significantly diminished postoperative breast and nipple/areolar sensation remain major drawbacks. We present a novel technique for implant reconstruction combining several of the latest advances in breast oncologic surgery, reconstructive surgery, and peripheral nerve surgery to achieve what we feel to be an optimal outcome both in terms of esthetics and sensation.

METHODS: Eleven women (21 breasts) underwent nipple-sparing mastectomy and single-stage, direct-to-implant, prepectoral breast reconstruction. During the mastectomy, a careful dissection performed along the lateral aspect of the breast allowed identification and in some cases preservation of the T4 and T5 intercostal nerves. In cases where the nerves could be preserved without compromising the oncologic safety of the mastectomy, they were left intact heading into the subcutaneous tissue of the lateral mastectomy skin flap. When preservation was not feasible, neurorization of the nipple/areolar complex (NAC) utilizing allograft coapted from either the T4 or T5 lateral intercostal nerves proximally to subareolar nerves distally identified at the completion of the mastectomy. Two-point discrimination was measured preoperatively in all 4 areolar quadrants and the nipple and repeated postoperatively at 3 and 6 months. Sensation to gross, light touch throughout the rest of the reconstructed breast was also assessed (with an added evaluation point of 1 month postoperatively), as was patient satisfaction with their overall breast and NAC sensation.

RESULTS: At the time of submission, 7 women (13 breasts) had $\geq$ 6 months of follow-up, with another 3 patients (6 breasts) with over 3 months of follow-up. In patients with $\geq$ 3 months follow-up, NAC 2-point discrimination was found to be preserved compared with preoperative values in 16 breasts (84%), was worse in 2 breasts (11%) of patients, and had actually improved in 1 breast (5%). All of the patients in studied had grossly intact sensation to light touch throughout the majority of, if not their entire, reconstructed breasts. All patients reported good satisfaction with their sensory outcomes. None of the women developed hyperesthesia, allodynia, or other symptoms concerning for neuroma formation.

CONCLUSIONS: This initial pilot study demonstrates as a proof of concept that nerve grafting in conjunction and/or careful nerve preservation at the time of nipple-sparing mastectomy with implant-based breast reconstruction is safe and effective, with a nearly 90% rate of preserved sensation postprocedure. Longer follow-up may yield even

**Nerve Allografting for Sensory Innervation Following Immediate Implant Breast Reconstruction**

**Presenter:** Ziv M. Peled, MD

**Co-Author:** Anne G. W. Peled, MD
greater return of sensation than seen here or possibly improved sensation from the preoperative baseline, particularly in patients receiving adjuvant chemotherapy or radiation therapy that could delay neurotization.

Selecting Patients for Autologous Free Flap Breast Reconstruction in Body Mass Index >35: Stratifying Surgical Risk Factors for Patient Inclusion or Exclusion

Presenter: Avinash P. Jayaraman, BA

Co-Authors: Austin S. Hembd, MD; Jeffrey N. Li, BS, BBA; Nicholas T. Haddock, MD; Sumeet S. Teotia, MD

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INTRODUCTION: Morbid obesity presents numerous challenges in autologous breast reconstruction. Along with considering other medical comorbidities, body mass index (BMI) alone can serve as an overall denominator in the decision-making process to offer or decline reconstruction.

METHODS: Retrospective chart review was performed on N = 350 patients who underwent bilateral breast reconstruction using deep inferior epigastric perforator flaps (n = 654 flaps). Patients were divided into 2 groups: patients with BMI ≤35 (group 1; N₁ = 273 patients; n₁ = 508 flaps) and patients with BMI ≥35 (group 2; N₂ = 77 patients; n₂ = 146 flaps). Comorbidities including age, BMI, hypertension, diabetes mellitus, autoimmunity, smoking status, previous deep venous thrombosis (DVT)/PE, and previous abdominal surgery were tracked. Donor site complications including wounds, infection, seroma, hematoma, and DVT/PE and abdominal bulge were tracked. Flap losses and hospital stays were accounted. All data were collected using a centralized REDCap database. Analysis was performed with SPSS: continuous variables were analyzed with t tests, and binary variables were analyzed with chi-square, or Fischer’s exact test for subgroups with n < 5.

RESULTS: Age, comorbidities, and medical histories were equivalent between groups, except for diabetes mellitus: group 2 (21%) had a significantly higher rate of diabetes mellitus than group 1 (7%; P < 0.01). Rates of infections requiring intravenous antibiotics (P = 0.056), seroma requiring operation (P = 0.750), hematoma requiring operation (P = 0.356), and DVT/PE (P = 0.512) were equivalent between groups. Rate of wound complications requiring operative repair was higher in group 2 (16%) than in group 1 (7%; P = 0.013). Surgical intensive care unit stay after flap procedure was equivalent between groups (group 1 = 2.22 days; group 2 = 2.32 days; P = 0.180). Total hospital stay was equivalent between groups (group 1 = 4.00 days; group 2 = 4.21 days; P = 0.091). Rates of abdominal bulge were equivalent between groups (group 1 = 4%; group 2 = 6%; P = 0.361). Umbilicus was sacrificed significantly more in group 2 (46%) than in group 1 (10%; P < 0.01). Flap loss was significantly higher in group 2 (4/146, 3%) than in group 1 (3/508, 0.6%; P = 0.026). Overall combined flap loss was 1%.

DISCUSSION: In our study, offering deep inferior epigastric perforator flaps to patients with BMI >35 seems to have a 5-fold increase in flap loss. Despite attempting to decrease wound complications in higher BMI patients by sacrificing umbilicus, operative intervention for postoperative wound complications is still more than twice that of lesser BMI patients. This could be accounted by 3 times higher diabetes mellitus encountered in our higher BMI group. Based on individual practice patterns, patients with BMI >35 can be educated of their higher risks in consideration as a candidate for free flap breast reconstruction.

Differential Gene Expression in Capsules Derived From Smooth and Textured Silicone Implants

Presenter: Giulia Daneshgaran, BS

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PURPOSE: Capsular contracture is the most common complication of implant-based breast surgery in the United States, leading to abnormal breast contour, increased firmness, and pain to touch. It is well established that smooth implants have higher rates of capsular contracture than textured implants. Assessing the effect of implant texture on contracture pathogenesis may help identify therapeutic targets for this disease process. The purpose of this study is to elucidate the pathogenesis of capsular contracture by examining RNA expression in a rat model of capsular formation around textured and smooth silicone implants, with pathologic correlation.

METHODS: A small animal model of capsular contracture was developed using Fischer rats. Ten animals underwent miniature smooth or textured silicone implant insertion in the submammary gland position. Six weeks postoperatively, implant capsules were harvested for histologic and molecular analysis. RNA sequencing was performed to identify target genes expressed in extracted capsules. Selected gene 

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