unilateral cleft lip (UCL) repair. Performance on the following tasks before (pre-intervention) and after (post-intervention) studying were evaluated: knowledge of surgical steps, lip markings on a three-dimensional (3D) stone model, and lip repair using a hands-on/high-fidelity 3D haptic model. Participant procedural confidence and satisfaction with each educational tool were also evaluated. Two expert reviewers blindly graded markings and surgical performance. Intra-class correlation coefficients (ICC) were calculated. Wilcoxon signed-rank and Mann-Whitney U tests were used.

RESULTS: Interrater reliability was strong for pre-intervention and post-intervention grading of markings (ICC=0.97; \( p<0.001 \) and ICC=0.96; \( p<0.001 \)) and surgical performance (ICC=0.76; \( p=0.01 \) and ICC=0.85; \( p=0.001 \)). Compared to pre-intervention, post-intervention marking performance (8.0±2.5 vs. 2.9±3.1; \( p=0.03 \)), procedural confidence (24.0±7.0 vs. 14.7±2.3; \( p=0.03 \)), knowledge (40.3±4.4 vs. 33.5±3.7; \( p=0.03 \)), and performance (20.3±3.6 vs. 15.3±3.1; \( p=0.04 \)) significantly improved in the digital simulation group, but not in the textbook group. All participants were more satisfied with the digital simulator as an educational tool (27.7±2.5 vs. 14.4±4.4; \( p<0.001 \)).

CONCLUSIONS: We present level I evidence suggesting that digital cognitive simulators lead to significant improvement in cleft surgery markings, as well as procedural confidence, knowledge and performance.

QS11

Fat Grafting Reverses Radiation-induced Skin Fibrosis And Groin Contracture

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PURPOSE: Radiotherapy (RT) is an effective adjunctive treatment of cancer; it can reduce tumor size and decrease local cancer recurrence. A significant adverse effect of RT, however, is the fibrosis incurred in the soft tissue surrounding the tumor. RT activates a number of fibrotic pathways which cause continued and substantial dermal induration with increasing time since exposure. Radiation-induced soft tissue fibrosis can alter cosmesis and result in functional impairments, such as impaired swallowing and limb contracture. Fat grafting is a minimally-invasive surgical technique gaining popularity for its ability prevent or reverse the radiation-induced soft tissue fibrosis. We developed a mouse model of radiation-induced hind limb contracture and explored the effects of fat-grafting in this context.

METHODS: We used Prx1Cre;R26mTmG mice, in whom a fibrogenic subpopulation of fibroblasts in ventral skin (PRRX-1+) are labelled by embryonic expression Cre, to explore the effects of radiation subpopulations of fibrogenic fibroblasts. The hind limbs of PRRX-1 mice were irradiated with 30 Gy fractionated in 5 Gy doses every two days for a total of 12 days. Significant limb contracture developed during the one-month recovery period. At this point, the mice were sacrificed, and hind limbs were processed for histology. Next, the hind limbs of CD-1 nude mice were irradiated with the same regimen, to explore the therapeutic effects of fat graft grafting. At five-weeks post irradiation, 200ul of human lipoaspirate fat or lipoaspirate enriched with adipose-derived stromal cells (ASCs, 10,000 cells/200ul) was injected into the subcutaneous space of the irradiated hind limbs. Control mice were injected with saline or received sham surgery with no injection. Limb extensibility was measured every two weeks for a total of 12-weeks, at which point mice were sacrificed for hind limb skin mechanical strength testing (MST) and histologic analysis.

RESULTS: Normal 0 false false false EN-AU X-NONE X-NONE /* Style Definitions */ table.MsoNormalTable {mso-style-name:"Table Normal"; mso-tstyle-rowband-size:0; mso-tstyle-colband-size:0; mso-style-noshow:yes; mso-style-priority:99; mso-style-parent:""; mso-padding-alt:0cm 5.4pt 0cm 5.4pt; mso-para-margin:0cm; mso-para-margin-bottom:.0001pt; mso-pagination:widow-orphan; font-size:12.0pt; font-family:"Calibri",sans-serif; mso-ascii-font-family:Calibri; mso-ascii-theme-font:minor-latin; mso-hansi-font-family:Calibri; mso-hansi-theme-font:minor-latin;} Hind limb irradiation significantly reduced limb extensibility compared to the non-irradiated side, with the greatest benefit of fat grafting was observed in the mice who received fat supplemented with SVFs, and little or no benefit seen in mice who received saline or sham treatment. These functional differences were associated with a significant increase in the fibrogenic Prx1+ fibroblast subpopulation. Hind limb irradiation significantly reduced limb extensibility compared to the non-irradiated side, with the greatest benefit of fat grafting was observed in the mice who received fat supplemented with SVFs, and little or no benefit seen in mice who received saline or sham treatment. These functional differences were associated with a significant increase in the fibrogenic Prx1+ fibroblast subpopulation. Fat grafting progressively improved limb extension, reduced skin stiffness, and reversed the fibrotic histological changes in the skin.
CONCLUSION: Our mouse model of radiation-induced hind limb contracture enables a detailed dissection of the interaction between grafted fat and radiation-induced soft tissue contracture. We show that fat grafting can reverse the fibrotic changes seen in irradiated skin and can improve the extensibility of contracted limbs post irradiation.

QS12

Deferoxamine Diminishes Breast Cancer Proliferation and Enhances Irradiated Breast Reconstruction: An Antitumorigenic Mechanism Defined

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PURPOSE: Radiation plays an essential role in the oncologic management of triple-negative breast cancer, but patients who undergo radiotherapy experience significantly more wound complications during the reconstructive process. Deferoxamine is an FDA-approved iron chelator with immense potential to up-regulate angiogenesis and improve reconstructive outcomes. More specifically, the ability of deferoxamine to mitigate the deleterious effects of radiation on skin and soft tissue has been shown to enhance expander-based irradiated breast reconstruction, increase fat graft retention, and facilitate irradiated transverse rectus abdominis myocutaneous flap survival. The purpose of this study is to determine the impact of deferoxamine on breast cancer cell proliferation in-vitro, in order to delineate oncologic safety concerns regarding the utilization of deferoxamine as a regenerative therapeutic.

METHODS: Triple-negative breast cancer cells, which do not respond to hormone or HER2 blocking therapy, were utilized in this study as patients with triple-negative breast cancer commonly receive chemoradiation and are potential candidates to receive deferoxamine as a regenerative therapeutic during the reconstructive process. The effect of radiation and deferoxamine on two triple-negative breast cancer cell lines (MDA-MB-231, MDA-MB-468) and one female fibroblast control cell line was determined via MTS (percent cell viability) analysis. Radiation (0, 5, 10 Gy) and deferoxamine (0, 25, 50, 75, 100 µM) were delivered individually and jointly, and all experiments were completed in triplicate. Intracellular iron concentration was determined via QuantiChrom™ assay, NF-κB localization was determined via dual-luciferase reporter assay, and apoptosis/necrosis was determined via annexin V assay in order to delineate mechanism. ANOVA statistical analysis was performed using SPSS (p<0.05).

RESULTS: Both triple-negative breast cancer cell lines exemplified a significant decrease in percent viability following exposure to 10 Gy of radiation (p<0.05) or 25 µM deferoxamine (p<0.01). The administration of radiation (10 Gy) in combination with deferoxamine (100 µM) to triple-negative breast cancer cells resulted in significant reduction of percent cell viability compared to the administration of radiation alone (p<0.05). Fibroblasts exemplified no significant response to individually administered radiation (10 Gy) or deferoxamine (100 µM), while joint administration of radiation (10Gy) and deferoxamine (25µM) resulted in a significant increase in percent cell viability compared to the administration of radiation alone (p<0.05). In both triple-negative breast cancer cell lines, individual administration of deferoxamine (100 µM) significantly decreased intracellular iron concentration (p<0.05). Joint administration of radiation and deferoxamine suppressed NF-κB activation indicating a cessation of cell proliferation and amplified cellular apoptosis (p<0.01) with no notable increase in cellular necrosis.

CONCLUSIONS: The administration of radiation and/or deferoxamine imparts a significant decrease in triple-negative breast cancer cell proliferation, without significantly impeding growth of female fibroblast control cells in-vitro. Mechanistically, deferoxamine administration decreases intracellular iron concentration leading to decreased cell proliferation and increased cell death via apoptosis. Taken together, these findings suggest deferoxamine may be safely utilized to facilitate improved reconstructive outcomes among triple-negative breast cancer survivors and warrant future investigations to quantify in-vivo effects.

QS13

Safety and Financial Outcomes of Breast Reduction Mammoplasty as an Inpatient or Outpatient Procedure: A Propensity-Score Matched Analysis of 18,780 Cases