METHODS: As part of an ongoing randomized, controlled crossover trial. Fat was harvested from the abdomen by manual liposuction, processed and injected by Coleman technique, and introduced into the macrochamber fat compartment (MAC) of 7 patients (11 feet) with an average volume of 6.9 cc per heel. Patients were offloaded in a customized Darco shoe for 4 wks post-operatively. Ultrasound-measured tissue thickness, pedobarograph-measured foot pressures, and Manchester Foot Pain and Disability Index (MFPDI) were obtained pre-operatively and followed for 1 year post-operatively. Outcomes were compared against a randomly selected control group (5 patients) who received standard of care offloading only.

RESULTS: Average age was 58 years. Average BMI was 30.5. No patients were active smokers or diabetic. When compared to controls, subjects who received fat grafting had significantly greater fat pad thickness at 6 and 12 months both at rest and under load (p<0.05). On pedobarograph, standing heel forces and pressures trended up across all time points while walking heel forces and pressures trended down across all time points. On the MFPDI, patients receiving fat grafting had significantly improved foot pain (p=0.015) and foot appearance (p=0.048) scores at 6 months.

CONCLUSION: Our current data suggests that fat grafting can restore foot function in patients with heel fat pad atrophy by preserving shock absorbing soft tissue and reducing pain. This has allowed many of our patients to resume previously untolerated activities. However, these findings will need to be corroborated in a larger sample and longer follow up which our ongoing trial aims to provide.

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PURPOSE: Obesity is a known risk factor for the development of breast cancer (BC) and is understood to have a negative impact on prognosis. Obesity is associated with less response to BC therapy and more aggressive disease. Adipocytes have been identified as a source of exogenous lipids in many cancer cell types, and are thought to provide energy to fuel malignant survival and growth in BC. This relationship is of particular relevance in plastic surgery as the oncologic safety of autologous fat transfer, an increasingly ubiquitous adjunctive procedure for breast reconstruction after mastectomy, is largely unknown. Although clinical studies to examine this question are underway, an in vitro system is critical for elucidating the complex interplay between the cells that normally reside at the surgical recipient site. We have developed a 3D, patient-derived tissue engineered platform to directly assess the metabolic interactions among cells within the BC tumor microenvironment.

METHODS: Breast adipose tissue was acquired from patients undergoing breast reduction surgery. The tissue was enzymatically digested and sorted by differential centrifugation to retrieve adipocytes and ASCs. Polydimethylsiloxane wells were filled with type I 0.3% (w/v) collagen and seeded with varying concentrations of adipocytes labeled with the fluorescent lipid dye boron-dipyrromethene (BODIPY) and ASCs in the bulk, and fluorescently-labeled MDA-MB-231 BC cells on the surface. Cultures of BC cells in non-adipocyte containing collagen matrices served as controls. Lipid transfer and BC cell invasion into the collagen-adipocyte/ASC bulk matrices were analyzed using laser scanning confocal microscopy and image analysis.

RESULTS: As the BODIPY lipid stain was added to the adipocytes prior to seeding of the BC on the surface, any BODIPY staining seen within the BC cells must have originated from within the adipocytes. After 24 hrs of co-culture, the 3D collagen culture platform demonstrated BODIPY-stained mature adipocytes surrounded by stromal cells, akin to the native architecture in human breast tissue. At the interface of the cancer cells with the stroma, lipid transfer was observed from adipocytes to BC cells as demonstrated by the change in the morphology of BC cells in proximity to the lipid-filled adipocytes from a spindle-like shape to more round appearance, filled centrally with green fluorescent lipid droplets and the cytosol pushed to the periphery.

CONCLUSION: We have established a novel 3D platform to study BC microenvironment, including metabolic

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Interrogating the Metabolic Interactions Between Adipocytes and Breast Cancer in a Patient-Derived Tissue Engineered Platform—Implications for the Safety of Autologous Fat Transfer in the Setting of Breast Ductal Carcinoma

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interactions between primary human breast adipocytes and BC cells. Transfer of fluorescently-labeled lipids directly from adipocytes to BC cells may induce aberrant metabolism to fuel malignant growth and adaptive survival, while the presence or absence of ASCs and adipocytes enables analysis of their effect on metastatic progression. Our novel, 3D platform can untangle the complex interplay within the entire breast cancer tumor microenvironment for high-throughput analysis and can help elucidate the safety of adipose tissue transfer, with and without ASC enrichment, in breast reconstruction in post-oncologic breast reconstruction.

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Vascularized Bone Grafting for Reconstruction of Oncologic Defects in the Spine: A Systematic Review and Pooled Analysis of the Literature

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PURPOSE: Resection of primary spinal tumors inevitably requires reconstruction of the resultant defect for restoration of spinal column stability. Traditionally, some combination of bone grafting and instrumentation is implemented. However, delayed healing environments are associated with complications including pseudoarthrosis and failure with use of these modalities. Implementation of vascularized bone grafting (VBG) in lieu of avascular grafts to complement hardware may present a solution to this dilemma. In order to assess the efficacy of and indications for VBG in oncologic spinal reconstruction, we performed a systematic review and pooled analysis of relevant literature.

METHODS: We searched PubMed/MEDLINE, Embase, Cochrane, and Scopus databases for relevant studies published through September 2017, according to PRISMA guidelines. We performed a pooled analysis of studies with n &gt; 5, to estimate the percentage of overall complications, wound complications, fusion, and reoperation rates using RevMan software.

RESULTS: We identified 21 eligible studies and ultimately executed a pooled analysis of 12. Our analysis indicates an 89% rate of successful union (95% CI: 0.75–1.03) when VBG is employed in spinal reconstruction after primary tumor resection. The associated overall complication rate was 42% (95% CI: 0.23, 0.61) and reoperation rate was 27% (95% CI: 0.12, 0.41) in the pooled cohort. According to our review only 15 out of a total 209 patients (7.2%) had instrumentation failure and mean time to union was 5.975 months. Overall, consensus in the literature is that introduction of vascularized bone into previously irradiated or infected tissue beds proves advantageous given decreased bone resorption, increased capacity for load bearing, and faster consolidation as compared to other methods. Reported downsides to this technique included longer operative times, potential donor site morbidity, and difficulty in coordinating care to ensure access to a microsurgeon.

CONCLUSION: Our results demonstrate that overall complication rates after use of VBG is not wildly different from those reported in studies using non-VBG for similar spinal reconstructions, however fusion rates are better. In particular 89% fusion is demonstrated in our analysis versus rates ranging from 37–49% in studies using non-VBG. Given these rapid fusion rates and even the possibility of hardware independence, VBG may be particularly useful in reconstructing large defects in patients with longer life expectancies and therefore higher anticipated strain on constructs. This technique is also worth consideration for patients with a history of chemoradiation and/or infection at the site of tumor resection. Our experience supports use of VBG for creating strong, stable spinal constructs, particularly in said higher risk patients.

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Structural Analysis of Murine Versus Human Adipose Tissue Via Three-Dimensional Confocal Microscopy