Methods: Full thickness skin samples were collected from irradiated and non-irradiated breast cancer patients at the time of mastectomy and either autologous or alloplastic reconstruction. Cases performed in either delayed or immediate fashion were included. Additional samples were collected 3-6 months later at the time of secondary revision. Samples from patients undergoing non-oncologic breast surgery or prophylactic mastectomy were included as controls. Internal control samples were collected when symmetry procedures were performed. All samples were analyzed using RNA-Seq to determine the cellular transcriptome for irradiated versus non-irradiated breast skin, both before and after reconstruction. Gene expression was then analyzed via hierarchical clustering to determine the biologic pathways that were altered by radiation and reconstruction.

Results: Gene expression profiles of 50 patients were analyzed. Irradiated samples were shown to have distinct profiles from non-irradiated and control samples. Genomic analysis demonstrated multiple dysregulated biologic pathways in irradiated tissue. In irradiated patients who underwent autologous reconstruction, a number of these dysregulated genetic pathways were reversed to near-normal levels post-reconstruction. This regenerative phenomenon was less clear in the alloplastic reconstruction group.

Conclusion: We utilized gene expression profiling to identify biologic pathways that are altered by radiation therapy and demonstrated that autologous reconstruction with microvascular free tissue transfer may restore these dysregulated pathways to resemble non-irradiated, control tissue. We have identified future targets for primary inhibition or pharmacologic rescue of radiation-induced tissue changes. Presently, plastic surgeons can use these findings to tailor reconstructive efforts in irradiated patients to reverse these detrimental phenotypic changes and improve overall reconstructive outcomes.

Orally Administered 9-cis Retinoid Acid Improves Functional Lymphatic Drainage In Post-surgical Lymphedema

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