3D Analysis of How Radiation Effects DIEP Flap Volume, Projection, and Position

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Abstract Text:

Analyze our cohort of immediate, bilateral DIEP flap (BDF) for breast reconstruction that underwent post-operative radiation (POR). We utilized 3D imaging to assess volume, projection, and flap position changes between the radiated and non-radiated sides.

We performed a retrospective review of all BDF reconstruction by a single surgeon that underwent POR between the years 2005-2011. Demographic data was collected: oncologic, surgical, and radiation. Contralateral non-radiated flaps served as patient’s inherent control. 3D photos were then taken at least 6 months after completion of radiation and Geomagic software was utilized to analyze volume, projection, and flap position between the two sides. A survey was then performed to assess patient perception of reconstruction and overall aesthetic result.

19 met the inclusion criteria. Average time from radiation to image acquisition was 1.93 years. There were no flap complications or fat necrosis. The average breast volume for the radiated side (RS) was 630 cm$^3$ and 690 cm$^3$ for the non-radiated side (NRS) (p=0.13). Projection was also similar between the RS and NRS with the RS being 4.6 cm from the chest wall and NR being 4.8 cm, on average. (p=0.22) The only statistical difference between the RS and NR was the flap position on the chest wall. The RS were noted to be significantly higher on the chest wall (average 1.3 cm, SD: 0.05-3.69 cm) in comparison to the NRS. (p<0.004).

The Breast Q survey revealed the majority of patients were “very satisfied” with their result, but did appreciate differences in breast shape and size. 56.3% did appreciate a textural change in the flap after radiation, but interestingly 0% appreciated a change in their flap position. 87.5% of patients recommended undergoing immediate reconstruction with radiation versus having their reconstruction delayed.

The literature on radiated DIEP flaps (RDF) is controversial and equivocal. Our study suggests RDF do undergo changes in response to radiation, although not consistently. 3D analysis suggests that flap position is the only predictable parameter that changes. Flap volume and projection did not reveal a statistical difference between the RS and NRS. Patient survey illustrated that patients place more emphasis on duration of treatment, than cosmesis and prefer immediate reconstruction. Immediate, autologous reconstruction should be re-considered as a viable option for patients undergoing post-operative radiation

Reference Citations: