Indocyanine Green (ICG)-Based Intraoperative Angiography Validates Use of Nipple Delay for Patients Undergoing Nipple Sparing Mastectomies

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BACKGROUND

• Viability of the nipple areolar complex (NAC) is key to achieving an optimal aesthetic result from nipple sparing mastectomy (NSM) with reconstruction.

• Nipple delay (ND) is a first-stage procedure dividing blood flow from the gland to the NAC to increase blood flow through the skin and subcutaneous tissue to the NAC and decrease risk of necrosis from subsequent NSM.

• The purpose of this study was to use quantitative measurements from ICG angiography to determine if objective evidence can validate the merits of ND prior to NSM.

METHODS

• Patients underwent ND procedures through a portion of the planned NSM incisions 2 to 3 weeks prior to NSM.

• Imaging sequences were obtained intraoperatively with the SPY Elite (Novadaq Inc.) imaging system prior to and immediately following the ND and NSM.

• Frames with the maximum fluorescence at the nipple were analyzed retrospectively utilizing the SPY quantification tool kit.

• Absolute values were placed at the maximum fluorescent point of the nipple.

• Maximum and minimum values of the areola were recorded.

• Absolute numbers represent the intensity of fluorescence at the area of interest. Pixel scale has values from 0-255, with 0 being the lowest intensity and 255 being the highest. This was defined as average absolute perfusion (AAP).

RESULTS

• The control group, without prior nipple delay (ND), had 10 breasts in 6 patients who underwent NSM. Twelve breasts in 6 patients underwent bilateral ND followed by bilateral NSM an average of 18 days later.

• Average age for the control group was 50.5, AAP baseline decreased from 198 to 42 following NSM. Average age for ND group was 37; AAP baseline decreased from 170 to 105 during ND. No patients had full thickness loss of the nipple or areola.

• One in the ND group had a small area of epidermolysis of the nipple and one in the control group had an area of breast skin necrosis. Both healed completely without any visible cosmetic deformity. The AAP of both nipples in patients who had undergone a prior ND had increased to a new baseline of 248 and dropped to 116 following NSM: a decline of 53% but a higher final value.

• The ND patients had a 19% higher initial reading and 145% greater final value compared to those without ND prior to NSM. Similar changes were seen in the readings from the areola of both groups.

CONCLUSIONS

This study suggests that by using the SPY with ICG angiography, it is possible to collect objective data that ND can increase the blood flow to the NAC in patients planning to undergo subsequent NSM. This approach should lead to an increased likelihood of viability of the NAC following NSM. Nipple delay should be considered in any patient at risk of full thickness loss of portions of the NAC following NSM.