

Balancing Flap Perfusion & Donor Site Morbidity: An Evidence-Based Approach to Optimizing Outcomes for Free Flap Breast Reconstruction

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Abstract

Introduction: The authors have previously described how specific flap design characteristics such as free transverse rectus abdominis musculocutaneous (FTRAM) vs. deep inferior epigastric perforator (DIEP) flap type, medial vs. lateral deep inferior epigastric artery (DIEA) branch harvest, and DIEA perforator number affect postoperative outcomes.(1, 2) The purpose of this study is to facilitate the development of an algorithmic approach to abdominal based free flaps for breast reconstruction by evaluating how specific flap design characteristics affect the balance between donor and recipient site complications.

Methods: We reviewed the outcomes of consecutive patients who underwent immediate or delayed breast reconstruction by multiple surgeons using DIEP and FTRAM flaps at a large U.S. cancer center over a ten-year period. The primary outcome measures included recipient site and donor site complications. Fat necrosis and partial flap necrosis as well as hernia and bulging were considered mutually exclusive conditions. Univariate and multivariate logistic regression modeling analyzed the affect of patient and reconstruction characteristics on overall and specific postoperative outcomes.

Results: A total of 1418 flaps in 1127 patients were evaluated: (68.7% DIEP flaps vs. 31.3% FTRAM). Average follow-up was 42.8 ± 30.9 months. More DIEP flaps than FTRAM flaps were harvested with a single DIEA branch (60.1% vs. 39.9; $p < 0.01$). Mesh closure was more common for double DIEA branch flap donor sites ($p < 0.01$). The rates of fat necrosis/partial flap necrosis were higher for DIEP (11.1%) than FTRAM flaps (7.6%; $p = 0.02$). Bulges were similar for DIEP (3.6%) and FTRAM flaps (3.5%; $p = 0.86$), but hernias were less common in DIEP (1.2%) than FTRAM flaps (3.0%; $p = 0.03$). Higher rates of fat necrosis/partial flap necrosis were observed among flaps with one (15.2%) or two (11.1%) than ≥ 3 perforators (8.5%; $p = 0.05$). Bulge rates were not affected by perforator number, but hernias were less common in one (0.8%) and two (0.8%) than ≥ 3 perforator (1.8%) donor sites ($p = 0.05$). We saw lower rates of fat necrosis/partial flap necrosis for flaps that included perforators originating from both branches of the DIEA (5.5%) than from a single branch of the DIEA (12.0%; $p < 0.01$). Bulge rates were similar for double vs. single DIEA branch donor sites (3.6% vs. 3.5%), but hernias were higher among double vs. single branch donor sites (3.2% vs. 1.7%), although this difference was not statistically significant ($p = 0.06$). Univariate analysis demonstrated BMI $> 25 \text{ kg/m}^2$ ($p < 0.01$), diabetes mellitus ($p = 0.02$), and

hypertension ($p < 0.01$) predictive of overall complications, but multivariate analysis showed only BMI $> 25 \text{ kg/m}^2$ remained significantly predictive of overall complications ($p < 0.01$).

Conclusions: In this study representing one of the largest studies of abdominal based free flap breast reconstruction, we have demonstrated that FTRAM flap design, ≥ 3 perforator inclusion, and double DIEA branch harvest decrease fat necrosis and partial flap necrosis at the expense of increased abdominal hernias. DIEP flap design, 1 or 2 perforator flap inclusion, and single DIEA branch harvest decrease abdominal hernias at the expense of increased fat necrosis and partial flap necrosis. Armed with this evidence, surgeons may more clearly understand how these factors affect the balance between recipient site perfusion and donor site integrity to design a flap appropriate to the needs of their specific patient.

References

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2. Garvey PB, Salavati S, Feng L, Butler CE. Perfusion-related complications are similar for DIEP and muscle-sparing free TRAM flaps harvested on medial or lateral deep inferior epigastric artery branch perforators for breast reconstruction. *Plast Reconstr Surg.* 2011;128:581e-589e.