

Assessment of Free Flap Breast Reconstructions

Loretta Coady-Fariborzian, MD; Christy Anstead, ARNP-BC; Mark Leyngold, MD; and James McGuire, MD

Free flap breast reconstruction may be offered as a treatment option at federal facilities with appropriate patient selection and planning.

Free flap autologous breast reconstruction is an excellent surgical option for breast reconstruction in select patients. A free flap involves moving skin, fat, and/or muscle from a distant part of the body, based on a named blood supply (pedicle), and attaching it to another blood supply adjacent to the acquired defect. This procedure is particularly useful in areas where local tissue supply is lacking in volume or is damaged due to trauma or radiation. These reconstructions are performed largely in high-volume centers outside the VA because of the required specialized level of surgical training, manpower, and nursing support.¹ The Malcom Randall VAMC in Gainesville, Florida, started offering autologous free flap breast reconstruction as an option to select patients in October 2012.

The Malcom Randall VAMC operating room (OR) does not operate 24/7, and the system has limited available OR time and surgical staff compared with the volume of patients requesting care.² Operative planning for free flap autologous breast reconstruction must occur

months ahead of surgery to balance the system limitations with the ability to offer the highest level of care. Planning includes strict patient selection, preoperative imaging, practice runs with OR staff, use of venous couplers, and frequent intensive care unit (ICU) staff in-services. Planning also includes the need to keep surgeries within the allocated OR time to avoid shift changes during critical periods. Frequent and early communication occurs between the surgical scheduler, OR nurses, and the anesthesia and critical care teams.

Studies have found that the best chance of flap salvage in the event of a thrombotic event is a rapid return to the OR.³ It is essential to minimize the risk of emergent returns to the OR because it is not staffed throughout the night. Patient risk factors for perioperative vascular complications include hypercoagulable disorders, peripheral vascular disease, use of the superficial epigastric system, and smoking.^{4,7}

A PubMed search for free flap reconstruction solely within the VA over the past 20 years found 1 article discussing the use of free flaps in head and neck reconstruction which demonstrated an impressive success rate of 93%.⁸

The object of this study was to assess free flap breast reconstruc-

tion results at the Malcolm Randall VAMC to determine whether it is a realistic treatment to offer in the federal system.

METHODS

The Malcolm Randall Institutional Review Board approved a retrospective chart review of all autologous free flap breast reconstructions using CPT code 19364, performed from October 2012 to June 2016. Medical records of patients who had a free flap breast reconstruction were queried during that period. Patient age; comorbidities listed on the electronic medical record “problem list;” body mass index (BMI); type of reconstruction (delayed vs immediate); length of surgery; length of stay; and complications over a 30-day period were recorded (Table). The authors looked for documentation of preoperative imaging and unplanned returns to the OR within the 30-day period.

Of 3 full-time VA plastic surgeons on staff during the study period, 2 surgeons had advanced fellowship training in either microsurgery or hand and microsurgery. Plastic surgery fellows and general surgery interns participated in the surgeries and postoperative care. The service had 1 dedicated advanced practice registered nurse

Dr. Coady-Fariborzian, Dr. Leyngold, and Dr. McGuire are surgeons, and **Ms. Anstead** is a nurse practitioner, all at Malcom Randall VAMC in Gainesville, Florida.

Figure 1A. Preoperative Unilateral Deep Inferior Epigastric Perforator Flap



Figure 1B. Postoperative Unilateral Deep Inferior Epigastric Perforator Flap After Balancing



Figure 1C. Preoperative Muscle-Sparing Bilateral Free Transverse Rectus Abdominis Musculocutaneous Flap



Figure 1D. Postoperative Muscle-Sparing Bilateral Free Transverse Rectus Abdominis Musculocutaneous Flap



involved in the surgical scheduling and perioperative care.

RESULTS

A total of 11 abdominally based free flap breast reconstructions—6 muscle-sparing transverse rectus abdominus musculocutaneous (TRAM) and 5 deep inferior epigas-

tric perforator (DIEP) flaps—were performed in 8 patients during the study period (Figures 1A, 1B, 1C, and 1D). Patient ages ranged from 31 to 58 years with a mean of 45.6 years. Six patients had preoperative computer tomography angiography (CTA) to define the location of the abdominal wall per-

forators. One muscle-sparing free flap was performed immediately after mastectomy; the other free flaps were performed as delayed reconstructions. Body mass index ranged from 24 to 35, with a mean of 30. All patients reported no tobacco use during the consultation; however, 1 patient later admitted to chewing tobacco. No urinary cotinine confirmation was requested. Two patients had 1 free flap reconstruction and 1 pedicle TRAM. This bilateral combination has been recently described in the literature and was chosen as a reasonable option to balance limited resources with abdominal wall morbidity.⁹ Operating room time ranged from 7 hours 50 minutes to 13 hours 3 minutes. All patients went to the ICU for hourly flap monitoring.

Length of stay ranged from 4 to 7 days, with a mean of 4.5 days. The longest stay was for a patient who had immediate reconstruction using a pedicle TRAM and muscle-sparing free TRAM. She was not a DIEP candidate because poor perforator quality had been noted during preoperative imaging.

Six patients had documentation of postoperative wound complications. One patient returned to the OR on the elective schedule 3 weeks postoperatively for a partial flap debridement. Her tissue transfer was > 1,000 g, and she required a matching reduction on the other side. There were no complete flap losses or postoperative thrombotic events; no cases went back to the OR emergently.

DISCUSSION

With the number of women veterans steadily increasing, the number of patients in need of breast cancer surgery, including reconstruction, will rise in the VA.¹⁰ Fortunately, breast reconstruction is an elective

Table. Patient Data

Age	BMI	Comorbidity	Reconstruction Type	Operating Time (h:min)	Length of Stay (d)	Complications
52	24	DCIS, hypothyroid, supraventricular tachycardia, psychosis, apnea	Immediate right pedicle, left muscle-sparing free TRAM	11:44	7	Small donor dehiscence; abdominal bulge
54	31	Breast cancer, chemotherapy, radiation	Delayed left DIEP	7:50	4	Partial flap necrosis, seroma, donor dehiscence
45	30	DCIS, hypertension, reflux	Delayed right DIEP, left pedicle TRAM	11:25	5	None
43	30	DCIS, chews tobacco	Delayed bilateral muscle-sparing free TRAM	13:03	4	Donor and recipient wound dehiscence
31	31	Breast cancer epilepsy, migraines	Delayed bilateral muscle-sparing free TRAM	11:27	4	Recipient dehiscence
58	35	Breast cancer, radiation therapy, chemotherapy, hypertension	Delayed right DIEP	8:25	4	Small recipient dehiscence
41	29	Breast cancer, hypertension, asthma, depression	Delayed right DIEP	9:23	4	Partial flap necrosis, small donor and recipient dehiscence
41	31	Breast cancer, chemotherapy, anxiety	Delayed right DIEP, left muscle-sparing free TRAM	10:28	4	None

Abbreviations: BMI, body mass index; DCIS, ductal carcinoma in-situ; DIEP, deep inferior epigastric artery perforator (flap); TRAM, transverse rectus abdominus myocutaneous (flap).

procedure. Immediate breast reconstruction is a popular option because patients can combine surgeries and potentially avoid 2 recovery periods, and a better aesthetic outcome is possible because the skin does not have time to contract. Although immediate reconstruction has been increasing in popularity, it is associated with a higher complication rate.¹¹ Further, reconstruction can be jeopardized if the oncologic plan is changed in the early postoperative period.

Positive margins found after an autologous reconstruction result in a more complicated postoperative course and a higher rate of wound complications.¹² Unexpected radiation therapy after autologous reconstruction can severely distort a tissue

flap because of fat necrosis, fibrosis, and contraction.^{13,14} From a practical perspective in the federal system, it is very difficult to coordinate 2 surgeons' schedules when the system is already struggling to keep up with demand. Splitting the ablative and reconstructive surgery allows the urgent problem (cancer) to be addressed first, ensuring clear margins and allowing the patient to recover and consider all reconstructive options without feeling time pressure.

A large tertiary care center will have staff and equipment redundancy, but this study had to consider limitations in resources. The preoperative lead time allows the ICU to arrange a bed for hourly flap checks and for in-servicing new nursing

staff on free flap monitoring. This was well received, and patients gave positive feedback on the staff. The OR schedulers can schedule nurses and techs who are familiar with the microscope and microsurgery instruments. The micro sets were opened, and the microscope powered on for practice runs a week before the procedures to insure no broken or missing instruments.

High-procedure volume would logically improve efficiency. Although the VA is not likely to become a tertiary center for breast reconstruction, the findings of other high-volume microsurgeons can be applied to improve speed and limit complications. Efforts to limit the OR time included use of preoperative imaging

and intraoperative venous couplers. Venous couplers can result in shorter OR time, fewer returns to the OR, and excellent patency rates.^{15,16} One microsurgeon performed his surgery using only loupe-assisted vision (x 3.5), without use of the microscope. Pannucci and colleagues have recommended this as a way to improve access and OR efficiency.¹⁷ Use of the CTA has been found to decrease the rate of partial flap necrosis and improve speed of surgery.¹⁸⁻²⁰

Careful patient selection allowed a hospital stay that averaged 4.5 days and minimized risks for return to the OR. Only patients who were nonsmokers were offered the surgery. Average BMI was 30 to prevent the known operative risks in breast surgery patients who are morbidly obese.²¹⁻²³ No patients had a history of thromboembolic disease. Most patients were discharged home from the ICU. They eventually returned for elective revisions, second stages, and balancing procedures.

CONCLUSION

Free flap breast reconstruction can be offered as a treatment option with appropriate patient selection and planning. The most efficient way to provide this procedure within the federal system and to minimize the risk of flap loss and complications is by offering delayed reconstruction, obtaining preoperative CTA imaging, utilizing venous couplers, and frequently communicating with all involved practitioners from the OR to the ICU. This small study provides a good starting point to illustrate that tertiary-care reconstructive surgery

can be offered to veterans within the federal system. ●

Acknowledgments

This material is the result of work supported with resources and the use of facilities at the North Florida/South Georgia Veterans Health System, Gainesville, Florida.

Author disclosures

The authors report no actual or potential conflicts of interest with regard to this article.

Disclaimer

The opinions expressed herein are those of the authors and do not necessarily reflect those of Federal Practitioner, Frontline Medical Communications Inc., the U.S. Government, or any of its agencies.

REFERENCES

1. Tuggle CT, Patel A, Broer N, Persing JA, Sosa JA, Au AF. Increased hospital volume is associated with improved outcomes following abdominal-based breast reconstruction. *J Plast Surg Hand Surg.* 2014;48(6):382-388.
2. Shulkin DJ. Beyond the VA crisis — becoming a high-performance network. *N Engl J Med.* 2016;374(11):1003-1005.
3. Novakovic D, Patel RS, Goldstein DP, Gullane PJ. Salvage of failed free flaps used in head and neck reconstruction. *Head Neck Oncol.* 2009;1:33.
4. Davison SP, Kessler CM, Al-Attar A. Microvascular free flap failure caused by unrecognized hypercoagulability. *Plast Reconstr Surg.* 2009;124(2):490-495.
5. Masoomi H, Clark EG, Paydar KZ, et al. Predictive risk factors of free flap thrombosis in breast reconstructive surgery. *Microsurgery.* 2014;34(8):589-594.
6. O'Neill AC, Haykal S, Bagher S, Zhong T, Hofer S. Predictors and consequences of intraoperative microvascular problems in autologous breast reconstruction. *J Plast Reconstr Aesthet Surg.* 2016;69(10):1349-1355.
7. Sanati-Mehrizi P, Massenburg BB, Rozehnal JM, Ignargiola MJ, Hernandez Rosa J, Taub PJ. Risk factors leading to free flap failure: analysis from the national surgical quality improvement program database. *J Craniofac Surg.* 2016;27(8):1956-1964.
8. Myers LL, Sumer BD, Defatta RJ, Minhajuddin A. Free tissue transfer reconstruction of the head and neck at a Veterans Affairs hospital. *Head Neck.* 2008;30(8):1007-1011.
9. Roslan EJ, Kelly EG, Zain MA, Basiron NH, Imran FH. Immediate simultaneous bilateral breast reconstruction with deep inferior epigastric (DIEP) flap and pedicled transverse rectus abdominis musculocutaneous (TRAM) pedicle flap. *Med J Malaysia.* 2017;72(1):85-87.
10. Leong M, Chike-Obi CJ, Basu CB, Lee EL, Albo D, Netscher DT. Effective breast reconstruction in female veterans. *Am J Surg.* 2009;198(5):658-663.
11. Kwok AC, Goodwin IA, Ying J, Agarwal JP. National trends and complication rates after bilateral mastectomy and immediate breast reconstruction from 2005 to 2012. *Am J Surg.* 2015;210(3):512-516.
12. Ochoa O, Theoharis C, Pisano S, et al. Positive margin re-excision following immediate autologous breast reconstruction: morbidity, cosmetic outcome, and oncologic significance. *Aesthet Surg J.* 2017; [Epub ahead of print.]
13. Garvey PB, Clemens MW, Hoy AE, et al. Muscle-sparing TRAM flap does not protect breast reconstruction from post-mastectomy radiation damage compared to DIEP flap. *Plast Reconstr Surg.* 2014;133(2):223-233.
14. Kronowitz SJ. Current status of autologous tissue-based breast reconstruction in patients receiving postmastectomy radiation therapy. *Plast Reconstr Surg.* 2012;130(2):282-292.
15. Fitzgerald O'Connor E, Rozen WM, Chowdhry M, et al. The microvascular anastomotic coupler for venous anastomoses in free flap breast reconstruction improves outcomes. *Gland Surg.* 2016;5(2):88-92.
16. Jandali S, Wu LC, Vega SJ, Kovach SJ, Serletti JM. 1000 consecutive venous anastomoses using the microvascular anastomotic coupler in breast reconstruction. *Plast Reconstr Surg.* 2010;125(3):792-798.
17. Pannucci CJ, Basta MN, Kovach SJ, Kanchwala SK, Wu LC, Serletti JM. Loupes-only microsurgery is a safe alternative to the operating microscope: an analysis of 1,649 consecutive free flap breast reconstruction. *J Reconstr Microsurg.* 2015;31(9):636-642.
18. Teunis T, Heerma van Voss MR, Kon M, van Maurik JF. CT-angiography prior to DIEP flap reconstruction: a systemic review and meta-analysis. *Microsurgery.* 2013;33(6):496-502.
19. Fitzgerald O'Connor E, Rozen WM, Chowdhry M, Band B, Ramakrishnan VV, Griffiths M. Preoperative computed tomography angiography for planning DIEP flap breast reconstruction reduces operative time and overall complications. *Gland Surgery.* 2016;5(2):93-98.
20. Malhotra A, Chhaya N, Nsiah-Sarheng P, Mosahebi A. CT-guided deep inferior epigastric perforator (DIEP) flap localization—better for the patient, the surgeon, and the hospital. *Clin Radiol.* 2013;68(2):131-138.
21. Ilonzo N, Tsang A, Tsantes S, Estabrook A, Thu Ma AM. Breast reconstruction after mastectomy: a ten-year analysis of trends and immediate postoperative outcomes. *Breast.* 2017;32:7-12.
22. McAllister P, Teo L, Chin K, Makubate B, Alexander Munnoch D. Bilateral breast reconstruction with abdominal free flaps: a single centre, single surgeon retrospective review of 55 consecutive patients. *Plast Surg Int.* 2016;2016:6085624.
23. Myung Y, Heo CY. Relationship between obesity and surgical complications after reduction mammoplasty: a systemic literature review and meta-analysis. *Aesthet Surg J.* 2017;37(3):308-315.