

## Comparison between the DIEP Flap and the Free TRAM Flap for Breast Reconstruction early Experience in Kasr-Alainy Hospital

*Ashraf Abolfotooh Khalil, Amr Ibrahim Fouad, Mohamed Hazem, Ahmed F. Aborady, Hatem Elshahar, Ahmed Ragab Morsi*  
Plastic Surgery Unit, Cairo University

### ABSTRACT

**Background:** The female breast can have a serious impact on a woman's self-esteem. Breast reconstruction contributes substantially to a woman's physical, emotional and psychological recovery from breast cancer. It enables the patient to feel whole again and restores her body image. **Aim of the Work:** The aim is to compare the free TRAM-flap and the DIEP flap regarding the flap complications and donor site morbidity in delayed breast reconstruction. **Patients & Methods:** Between June 2012 and June 2014, 21 patients underwent autologous tissue breast reconstruction using either free TRAM flap or free DIEP flap. **Conclusion:** There is no practical difference between the free TRAM flap and the free DIEP flap regarding donor site complications.

**Keywords:** Breast reconstruction, TRAM flap, DIEP flap

### INTRODUCTION

The female breast can have a serious impact on a woman's self-esteem. Mastectomy involves emotional loss as well as physical loss. The goal of breast reconstruction, either at the time of the mastectomy or delayed, is to replace not just the breast but any self-esteem or sense of femininity the patient may feel she has lost.

The lower abdominal soft tissue has been associated with higher satisfaction scores in the post mastectomy patient, attributable in large part to the creation of a ptotic, soft breast mound.<sup>2</sup>

Although the pedicled transverse rectus abdominis myocutaneous (TRAM) flap and the traditional free TRAM flaps (using the entire rectus muscle) are still performed, two excellent refinements include the deep inferior epigastric perforator (DIEP) flap and the muscle sparing TRAM flap.<sup>3</sup>

Surgeons often prefer autologous microvascular tissue among reconstructive options because it provides a natural, lasting breast that can be easily integrated into the patient's body image.<sup>1</sup>

The purpose of this study was to compare the free TRAM flap with its variations and the DIEP flap regarding the flap complications (total and partial flap loss, fat necrosis and venous congestion) and donor site complications (abdominal bulge and hernia and the patient abdominal wall function and appearance).

### PATIENTS AND METHODS

Between October 2012, and October 2014, 21 patients (21 flaps) underwent autologous tissue breast reconstruction using either a free TRAM flap or a free DIEP flap at Plastic Surgery Department at Cairo University Hospitals. The same surgical team has executed all the surgeries, to minimize variations in flap selection method and flap harvesting technique.

Pre-operative data were reviewed including patient age, body mass index, significant medical history, breast cancer history, history of the mastectomy and adjuvant therapy, smoking, and previous abdominal surgery.

Thorough examination of the ipsilateral side including the scar, axilla, and the contralateral breast, including the volume, nipple position is conducted. Abdominal wall examination is also done regarding the amount of tissue available in the lower abdomen, divarication of recti and the presence of scars or hernia.

Patients with general contraindications (cardiorespiratory disorders, uncontrolled diabetes, morbid obesity, autoimmune disorders, and severe thrombophilia) or local contraindications (prior division of the deep inferior epigastric vessels, prior abdominoplasty, inadequate recipient vessels) were excluded from the study.

Patients were photographed from front, oblique, and lateral views.

Patients under hormonal treatment were advised to cease the treatment for four weeks before and two weeks after surgery. Informed consent was taken from all patients.

#### Operative procedure

Two teams work simultaneously, the first team explore the recipient vessels (the internal mammary in all cases) and preparing the pocket, while the second team harvest the flap.

#### Flap harvesting technique:

First the upper border of the flap is incised. The elevation of an abdominoplasty flap is done then it is advanced downwards to determine the site of the lower incision.

Both sides are explored sequentially; the flap is raised over the anterior rectus sheath from lateral to medial exploring both lateral and medial rows of perforators.

An ideal candidate for a muscle-sparing TRAM or a DIEP flap is a healthy patient with minimal risk factors and with minimal to moderate volume requirement. For patients with high risk factors such as smoking and obesity or with a large volume requirement (i.e., 75 percent of the flap), a priority is to optimize perfusion to the flap by including as many major perforators as possible, up to using the full width TRAM flap. The final decision to do either a DIEP or free TRAM is taken intraoperatively based on the number, caliber, location, and course of the perforators. A DIEP flap is selected when there is a single large perforator (has palpable pulsations or heard by Doppler) or multiple moderate perforators on the same row and short intramuscular course are encountered. Otherwise a free TRAM flap is used, harvesting the full width of the muscle (MS-0), or preserving the medial or the lateral part of the muscle (MS-1), or just taking a small cuff of muscle around the

perforators and keeping most of the muscle (MS-2).

In case of DIEP or MS-TRAM the anterior rectus sheath and the muscle is split to trace the main branch to the deep inferior epigastric vessel.

Most of zone 3, all zone 4 are discarded depending on flap requirements and flap perfusion.

The recipient site is prepared by raising the mastectomy flaps, removal of the third costal cartilage, and preparation of the internal mammary vessels.

The flap is temporarily fixed to chest wall, microvascular anastomosis is done using 8/0 ethilon, shaping is done by deepithelialization of part of the flap and burying it under the mastectomy flap to give upper pole fullness, folding part of it under the flap to enhance projection, and taking suspension sutures.

Donor site was meticulously closed by running and interrupted non absorbable sutures. Single or double layer mesh is put, umbilicus is extruded through the abdominoplasty flap, suction drains are inserted, and the wound is closed in layers.

Monitoring of the flap is done by color, capillary refill, temperature, every 1 hour for 48 hours, and every 6 hours thereafter until discharge usually after seven days.

Patients are seen weekly for 1 month, then monthly for 6 months, photographs are taken, flap and donor site is assessed.

A simple questionnaire consisted of 6 simple questions is given to the patient asking about the ability to do house work, climbing stairs, getting up from lying down and performing sit-ups and if the shape of the abdomen is better to the patient compared to the preoperative status.

## RESULTS

**Table 1:** Patients' details

Group	Number of patients	Age (mean)	BMI (mean)	Follow-up months	Risk factors		
					Obesity (BMI >30)	Radiotherapy	Abdominal scars
DIEP	10	31-53 (36)	29-42 (34.4)	9-15 (12)	5	1	0
Free TRAM	11	33-48 (39)	27-45 (38.6)	10-18 (16)	7	4	3

**Table 2:** Classification of muscle sparing

Type of flap	Description	Number of patients
MS-0	full width, partial length of rectus muscle	4
MS-1	preservation of lateral segment	1
MS-2	preservation of lateral and medial segment	6
MS-3	=DIEP complete muscle preservation	10

**Table 3:** Operative details

Group	Mean Operative time (mins.)	Mean ischemia time (mins.)	Use of synthetic mesh in abdomen	Blood transfusion	Mean hospital stay (days)
DIEP	398	58	6	2	7.4
Free TRAM	362	55	7	2	7.5

**Table 4:** Flap complications

	DIEP (n=10)	Free TRAM (n=11)
Fat necrosis	2	1
Partial flap loss	1	0
Venous congestion	1	0
Total flap loss	0	0

**Table 5:** Clinical examination of the abdomen 7 months postoperatively in both groups

	DIEP (n=10)	Free TRAM (n=11)
Abdominal asymmetry	0	1
Abdominal bulge	4	5
Abdominal hernia	0	1
Umbilical asymmetry	1	1

**Table 6:** Result of the questionnaire

		DIEP	Free TRAM
getting up from lying down	The same	30%	9.1%
	Worse	70%	90.9%
The ability to do house work?	The same	60%	45.5%
	Worse	20%	27.25%
	Better	10%	27.25%
Ability to perform sit-ups	The same	60%	54.5%
	Worse	40%	45.5%
Climbing stairs?	The same	90%	91%
	Worse	10%	9%
The shape of your abdomen	The same	10%	9.1%
	Worse	-	18.2%
	Better	90%	72.7%



**Case 1: A 35 year old patient who underwent Lt breast reconstruction using free TRAM flap. a: Preoperative markings, b: Postoperative: anterior view, c: postoperative: lateral view**



**Case 2: A 42 year old patient who underwent Rt breast reconstruction using DIEP flap. a: Preoperative markings, b: Postoperative after 3 months, c: Postoperative after nipple and areola reconstruction**



**Case 3: A 38 year old patient who underwent Rt breast reconstruction using free TRAM flap. a: Preoperative markings, b: Postoperative: anterior view, c: postoperative: lateral view**

## DISCUSSION

Breast cancer continues to impact women and their families at an alarming rate. There are different approaches to reconstruction that vary depending on the type of mastectomy, the condition of the breast skin, and the patient's preferences.<sup>4</sup>

Although the pedicled transverse rectus abdominis myocutaneous (TRAM) flap provided a foundation for the rapidly growing field of breast reconstruction, the overall modern trend has focused on approaches which provide improved aesthetic outcomes while minimizing complications and donor site morbidity. Advances in microsurgical technique have thus led the field toward the utilization of free flaps, which benefit from a more profound blood supply while sacrificing less of abdominal wall, provide a longer pedicle that allows more freedom in flap inset. The surgeon can be more aggressive in folding, trimming, or otherwise shaping the free TRAM flap. Secondary revision is easier because the main blood supply to the flap comes from above so standard breast reduction techniques can be used to reshape the breast mound.

Other perforator flaps have emerged to address alternative donor sites. The gluteal artery perforator flap can be designed to harvest adipose tissue from either the upper [superior gluteal artery perforator (SGAP) flap] or lower [inferior gluteal artery perforator (IGAP) flap] buttock. Most would agree that these flaps are technically more difficult and have short pedicle. Also there is size discrepancy with gluteal veins, but turn to

it as the salvage flap of choice when the abdomen is no longer a viable option for reoperation procedures.<sup>6</sup>

Also Gluteal artery perforator flaps carry specific aesthetic challenges, as gluteal fat commonly is more firm and less pliable than fat harvested from the abdomen. This rigidity, for lack of a better word, prevents the folding of many gluteal reconstructions, a technical tool used for providing increased projection.<sup>7</sup>

It could be argued that the superficial inferior epigastric artery flap should be included in this comparison; however, it was not included because it is based on a different vascular system and its elevation does not need a myotomy or an incision in the anterior rectus sheath. In contrast, the DIEP and free TRAM flaps are both based on the deep inferior epigastric vascular system and both require that the anterior rectus sheath and rectus abdominis muscle be incised. These structures are the principal determinants that are responsible for abdominal contour and strength.<sup>12</sup>

Flap-related morbidity that included fat necrosis, venous congestion, and total necrosis demonstrated no significant difference between the free TRAM flap and the DIEP flap. To minimize flap-related morbidity, we were selective in the performance of the free TRAM flap and the DIEP flap. The final decision occurs during the operation after assessment of the perforators. This practice of selecting appropriate patient for the DIEP flap has also been reported by others. It seems that as surgeons become more comfortable with harvesting the DIEP flap and understand the anatomic and physiologic alterations that regulate flap perfusion, the

frequency of usage increases. Perforator diameter has become the principal factor affecting choice of DIEP flap.<sup>5</sup>

Our study reveals no significant difference in the ability to perform activities of daily living between patients who underwent a free TRAM and those who underwent DIEP flap breast reconstruction. We found no significant differences between the groups for problems with the ability to perform sit-ups or getting up from lying down or even lifting heavy objects.

In our experience, typical breast reconstruction patients, who are middle-aged, sedentary women who do not work or practice any daily sports; do not appear to require the full strength of both rectus abdominis muscles to perform their activities of daily living, and they do not even notice partial loss of abdominal motor strength following unilateral free TRAM flap or DIEP flap surgery.<sup>8</sup>

The use of synthetic mesh in cases of abdominal based free flaps especially the perforator flaps has always been controversial issue although some surgeons prefer to use synthetic mesh only if abdominal bulge occurs or true hernia in a secondary abdominal procedures or presence of large rectus sheath defect that can not be closed without tension; other surgeons prefer to use it as a prophylactic measure, in our early cases in this series we did not use a synthetic mesh we found high incidence of abdominal bulge in both groups so we divert to use a synthetic mesh routinely in all the patients with observation of decrease in the incidence of abdominal bulge.<sup>9</sup>

Regarding the number of perforators in DIEP flap group all cases harvested with one perforator except two cases with two perforators and one case with three perforators we found slight increase in flap related complications with use of single perforator. In a study done to assess whether the number of perforators harvested influences the overall deep inferior epigastric perforator (DIEP) flap survival and flap-related complications. This study demonstrates that the number of perforators does not impact the rate of flap survival.

However, the rate of fat necrosis may be significantly higher in DIEP flaps based on a single perforator. Multiple perforators should be utilized if possible to decrease the risk of fat necrosis.<sup>11</sup>

There is need to emphasize the idea that all forms of breast reconstruction should be presented to patients seeking our care (implants, myocutaneous flaps, and perforator flaps) in an unbiased educational setting. Patients are interested in a variety of issues that will facilitate their unique and personal decision for a breast reconstructive technique. Patients should be informed of perforator flaps even if a physician no longer offers microsurgery in their practice.<sup>7</sup>

#### Limitations

Most of the patients were housewives with sedentary life doing mostly house work with little or no sport activities, so the questionnaire done to assess the effect of operation on the activity of the patient was tailored to suite them. The small number of patients in this study (20 patients) is also considered among the limitations of this study.

### CONCLUSION

There is no practical significant difference between the free TRAM flap and the free DIEP flap regarding donor site complications. But, slight increase in flap complications in the DIEP flap when compared with the free TRAM flap and slight increase in donor site complications in free TRAM patients.

Use of routine mesh in cases of both types of flaps decreases the abdominal bulge postoperatively. There should be a balance between flap reliability and the potential for abdominal wall morbidity by paying attention to proper patient selection when deciding which flap will be used. The development of pre and intra-operative decision making in choosing the appropriate technique for each patient is vital. Awareness of breast reconstruction should be raised among breast cancer patients from the first day of diagnosis.

### REFERENCES

1. **Craft RO, Colakoglu S, Curtis MS et al.** Patient satisfaction in unilateral and bilateral breast reconstruction. *Plast Reconstruct Surg*, 2011; 127:1417–1424.
2. **Yueh JH, Slavin SA, Adesiyun T, et al.** Patient satisfaction in postmastectomy breast reconstruction: A comparative evaluation of

- DIEP, TRAM, latissimus flap, and implant techniques. *Plast Reconstr Surg.* 2010; 125:1585–1595.
3. **Nahabedian MY, Dooley W, Singh N, Manson PN.** Contour abnormalities of the abdomen after breast reconstruction with abdominal flaps: The role of muscle preservation. *Plast Reconstr Surg.* 2002; 109:91–101.
  4. **Wilkins EG, Cederna PS, Lowery JC, et al.** Prospective analysis of psychosocial outcomes in breast reconstruction: one-year postoperative results from the michigan breast reconstruction outcome study. *Plast Reconstr Surg* 2000; 106:1014e25.
  5. **Garcia-Tutor, E., and Murillo, J.** The ideal patient for the first breast reconstruction using a DIEP flap. *Plast. Reconstr. Surg.* 111: 947, 2003.
  6. **Granzow JW, Levine JL, Chiu ES, Allen RJ.** Breast reconstruction with gluteal artery perforator flaps. *J Plast Reconstr Aesthet Surg.* 2006;59:614–621
  7. **Massey MF, Spiegel AJ, Levine JL, et al.** Perforator flaps: recent experience, current trends, and future directions based on 3974 microsurgical breast reconstructions. *Plast Reconstr Surg* 2009;124(3):737–51.
  8. **Man LX, Selber JC, Serletti JM.** Abdominal wall following free TRAM or DIEP flap reconstruction: A meta-analysis and critical review. *Plast Reconstr Surg.* 2009; 124:752–764.
  9. **Nahabedian MY:** Secondary operations of the anterior abdominal wall following microvascular breast reconstruction with the TRAM and DIEP flaps. *Plast Reconstr Surg* 2007; 120: 365–372
  10. **Chevray PM.** Update on breast reconstruction using free TRAM, DIEP, and SIEA flaps. *Semin. Plast. Surg.* 18: 97,2004.
  11. **Grover R, Nelson JA, Fischer JP, Kovach SJ, Serletti JM, Wu LC.** The impact of perforator number on deep inferior epigastric perforator flap breast reconstruction. *Arch Plast Surg.* 2014;41:63–70.
  12. **Nahabedian MY, Tsangaris T, Momen B.** Breast reconstruction with the DIEP flap or the muscle-sparing (MS-2) free TRAM flap: is there a difference? *Plast Reconstr Surg* 2005 Feb;115(2):436e44.
-