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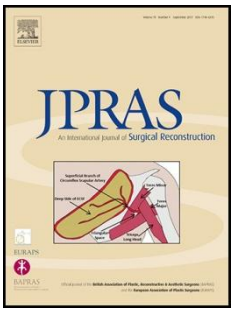

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LETTER TO EDITOR JPRAS

Re: Hernandez Rosa et al 2017

Hernandez Rosa J, Sherif RD, Torina PJ, Harmaty MA. *Use of both antegrade and retrograde internal mammary vessels in the bipedicled deep inferior epigastric perforator flap for unilateral breast reconstruction. J Plast Reconstr Aesthet Surg.* 2017 Jan, **70**(1): 47-53.

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Dear Professor Hart,

We thank Dr Rosa et al for sharing their experience of 20 bipedicled deep inferior epigastric perforator (DIEP) flaps for unilateral breast reconstruction utilising the extra-flap configuration of both anterograde and retrograde anastomoses to the internal mammary (IM) vessels.

We agree that double-pedicled lower abdominal flaps are an effective technique, particularly valuable in patients who are thin, are large-breasted relative to the size of their abdominal pannus, or have midline abdominal scars[1]. Studies suggest they carry no increased morbidity over unipedicled flaps.[2]

The paper stated that existing literature favours intra-flap anastomoses, however references to support this statement were not provided. The authors also cited a lack of evidence in the literature

for the efficacy of the double inflow, also known as extra-flap, technique. We wish to draw attention to the 2015 paper by Malata and Rabey[3] describing a single surgeon's series of 25 consecutive double-pedicled free flaps utilizing both intra-flap (n=6) and extra-flap (n=19) techniques with no flap losses, postoperative re-explorations for flap salvage, or fat necrosis. The paper also proposed an algorithm, enabling surgeons to decide, based on intra-operative findings, the most suitable microsurgical flap design in terms of flap pedicle, recipient vessels, and anastomotic configuration (**Figures 1**).[3]

We have updated the original prospectively collected dataset (November 2010 - March 2014[3]) with another 10 double-pedicled free flaps performed by the senior author (CMM) from April 2014 to August 2017. The entire series totals 35 double-pedicled free flaps (28 extra-flap, 7 intraflap). There have been no partial or total flap losses or postoperative re-explorations as shown in **Table 1.**

Rosa *et al* described increased perfusion as a key advantage of the double inflow/extra-flap configuration.[1] An additional advantage of extra-flap configurations over intra-flap configurations is the reduced likelihood of vessel caliber discrepancy. With an intra-flap configuration, there is often a size mismatch as the secondary pedicle (comprising the main deep inferior epigastric vessels harvested close to their origin) is usually anastomosed onto the primary pedicle at the so-called "inferior continuation" of the deep inferior epigastric vessels i.e. either the medial or lateral row branch, or the "superior continuation" past the perforating vessels, which are both inevitably of smaller diameter as they are further downstream from the proximal vascular tree. This benefit of extra-flap configurations is further supported by existing literature that suggests vessel caliber discrepancy between donor and recipient vessels is smaller in extra-flap anastomoses than in intra-flaps.[4] This means that extra-flap surgeries are technically less complicated for surgeons, hence reducing operative time and its associated risks.

Preservation of the thoracodorsal axis as a potential lifeboat for salvage surgery and the ability to shape and mould the new breast more easily are another two benefits highlighted by Rosa et al regarding the use of anterograde and retrograde IM vessels as recipients.[1] We agree that both the antegrade and retrograde internal mammary vessels are satisfactory recipients in extra-flap DIEP breast reconstruction. Tomioka *et al* confirmed that the retrograde vessels are hydrodynamically efficient and provide adequate flap perfusion in spite of documented reduced perfusion pressure.[4-5] The presence of valves could, however, theoretically impede retrograde flow in the internal mammary veins. Although not encountered in our experience, such cases are well documented.[5]

In view of the myriad of potential microvascular arrangements for double-pedicled abdominal free flaps, Malata and Rabey devised a comprehensive yet straightforward algorithm to facilitate deciding the most appropriate flap design and anastomotic configuration, specific to each patient's needs.[3] This algorithm addresses pedicle selection, extra-flap versus intra-flap configuration and recipient vessels (**Figure 1**).

In addition, we now also recommend routine preoperative CT angiography of the abdominal wall vessels as it assists in determining the cases more likely to be suitable for intra-flap anastomoses to the medial or lateral divisions of the main DIE vessels, depending on the level and size of the branching pattern. This is useful in view of the increased operative time and complexity associated with double-pedicled free flap breast reconstruction.[3]

Interestingly, Rosa et al advocated a crossed anastomotic configuration.[1] In the senior author's experience this does not confer any technical advantage, as crossing of the two sets of anastomoses is an "inevitable" consequence of the shaping process when forming the new breast mound in coned or folded bipedicled lower abdominal free flaps.

In conclusion, we concur with Rosa et al that the use of antegrade and retrograde internal mammary vessels for an extra flap configuration double-pedicled DIEP flap breast reconstruction is a good option for selected patients. However, we would like to draw the attention of the readership to our useful algorithm which serves as a simple but systematic aid to intraoperative decision-making, enabling reconstructive surgeons to methodically consider key factors of pedicle selection and anastomotic arrangement, thus minimising donor site morbidity, reducing flap harvest duration, and optimising vessel anastomoses and flap inset when performing double-pedicled abdominal free flap breast reconstruction.[3]

Figure 1 Caption: Flow charts depicting the intraoperative decision making process employed during selection of the configurations of the flap and recipient vessels in double-pedicled abdominal free flap microvascular anastomoses.

Reproduced with the permission of Frontiers of Surgery from Malata CM, Rabey NG. Decision making in double-pedicled DIEP and SIEA abdominal free flap breast reconstructions: an algorithmic approach and comprehensive classification. Frontiers in Surgery 2015.

Table 1 Heading:

Additional bipedicled abdominal free flaps: Patient summary (April 2014 to August 2017)

Conflict of interest

None.

Funding

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Ethical approval

Access to notes approved.

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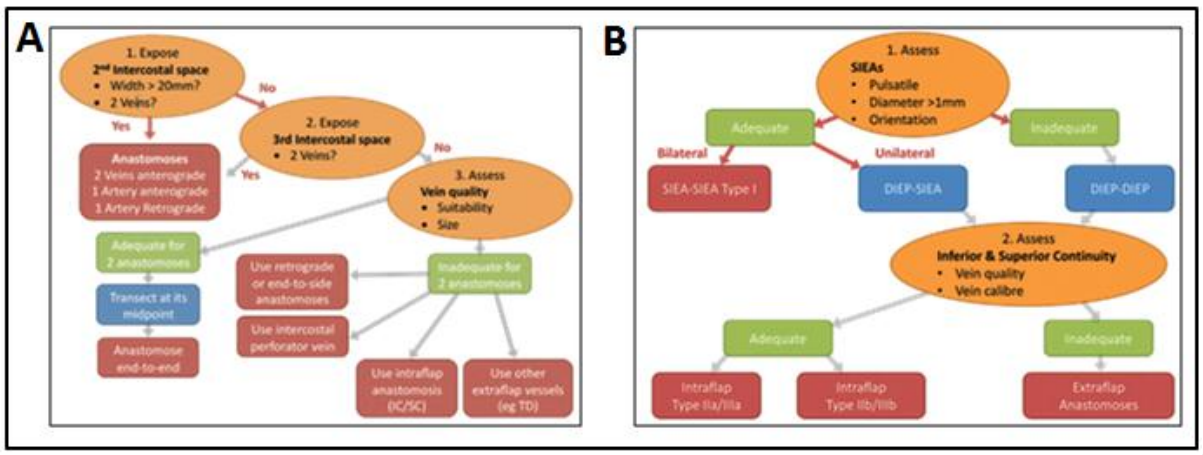

Figure 1

TABLE 1: Additional double-pedicled abdominal free flaps: Patient summary (April 2014 to August 2017)

Case no.	Age	BMI	Cup size	Immediate (I) /Delayed (D)	Flap configuration	Ischemia duration of 1st flap (min)	Surgery duration (min)	2nd Rib space width (mm)	Adjuvant postoperative therapy	Complications
26	55	28	N/A	Salvage	SIEA-DIEA extraflap	95	885	18/18/17	Yes. Preflap	On table redo arterial anastomosis
27	50	23.2	34C	I	DIEA-DIEA extraflap	127	655	23/22/22	None	-
28	40	22.6	34B	I	DIEA-DIEA extraflap	104	660	25/24/24	Yes. Postop	Flap larger than other breast even after RT
29	38	28.1	36D	Delayed	DIEA-DIEA extraflap	80	605	19/19/19	Yes. Preflap	-
30	66	21	N/A	Salvage	DIEA-DIEA extraflap	117	755	22/21/21	None	Minor liposuction of flap contour deficit
31	32	26.2	36C	I	DIEA-DIEA extraflap	72	682	22/21/21	None	-
32	39	29.7	36C	I	DIEA-DIEA extraflap	112	757	20/18/20	Yes. Postop	-
33	51	20.8	34C	I	DIEA-DIEA extraflap	85	824	18/17/18	Yes. Postop	On table redo arterial anastomosis
34	41	24	32A/B	I	DIEA-DIEA extraflap	92	796	24/25/24	Yes. Postop	-
35	51	20.3	30DD	I	IIIc (intraflap)	93	906	17/16/16	Yes. Postop	-

N/A = Pre-existing implants
RT = radiotherapy