Laparoscopic Transverse Rectus Abdominus Flap Delay for Autogenous Breast Reconstruction

Imad L. Kaddoura, MD, Ghattas S. Khoury, MD

ABSTRACT

Laparoscopic ligation of the deep and superficial inferior epigastric vessels was done for ten mastectomized patients who elected to have autogenous reconstruction of their breast. All these patients had at least one indication for the delay which included obesity, smoking, or requirement of a large volume of tissue for their reconstruction. The procedure did not add any morbidity or mortality to our patients and was found to be comparable to the "open" delay in preventing partial tissue loss in all but two patients. We describe the use of a minimally invasive procedure to augment the deep superior epigastric pedicled blood supply for the future transverse rectus abdominus flap. We have found in laparoscopic delay a safe, short procedure that is useful in high risk patients who choose the option of autologous breast reconstruction.

Key Words: TRAM flap, Laparoscopic, Delay, Mastectomy.

INTRODUCTION

The superiorly based pedicled transverse rectus abdominus myocutaneous flap (TRAM) has assumed its vital place as a tool among the various methods for immediate or delayed post mastectomy reconstruction. Skin necrosis after reconstruction using pedicled deep superior epigastric vessels is still a common complication, and many attempts have been made in the past few years to study ways and means of predicting and augmenting the flap dependability.

Laboratory clinical surgical delay of TRAM flaps at least one week before surgery was observed to decrease the risk of partial and complete necrosis. We have found laparoscopic ligation of the deep and superficial inferior epigastric vessels at the time of mastectomy to be an easy, practical and safe procedure that could replace the usual open surgical delay in the era of laparoscopy.

MATERIALS AND METHODS

The ten patients chosen for laparoscopic delay were of four categories:
1) Smokers--of more than one pack per day (four patients).
2) Obese--more than 20% of the peer group for age and height (three patients).
3) Both smokers and obese (two patients).
4) One patient who had a large volume requirement.

Laparoscopic delay was carried at the time of mastectomy one week prior to the TRAM flap reconstruction in four patients. In the remaining six patients, the delay was carried on an outpatient basis one week prior to their delayed reconstruction.

SURGICAL TECHNIQUE

All patients were pre-medicated one hour before the procedure, and elastic anti-thrombotic stockings were applied. Under general anesthesia, with the patient in the supine position, the abdomen was prepped and draped in the usual manner.

Pneumoperitoneum was established via a stab wound in the umbilicus. A 10 cm trocar was inserted, and a 0 degree laparoscope was attached to the camera and introduced.
Laparoscopic Transverse Rectus Abdominus Flap Delay for Autogenous Breast Reconstruction, Kaddoura I.

through the port. Full laparoscopy for the liver and the ovaries was performed to document absence of metastasis from the breast cancer. Another two 5 mm ports to the left and right of both recti muscles were also established, and the deep inferior epigastric vessels were identified. With the help of a scissors and grasping forceps, the peritoneum over the vessels was opened and the latter were isolated, double clipped and then divided from the internal iliac artery and veins at their take off. The superficial inferior system was marked with the doppler and, through a stab wound incision, was similarly isolated, divided and double clipped.

The skin wound was closed with a single layer of 5-0 nylon. Delayed reconstruction was performed one week to six months later on all of the ten patients who underwent modified radical mastectomy using the TRAM flap procedure as described by Hartrampf in 1982.6

**RESULTS**

Our patients’ ages ranged between 42 and 63 years, among which five were obese (i.e., more than 20% of the peer group for age and height). Two patients had adult onset diabetes that was controlled with oral hypoglycemics. In all six patients who opted for postponement of their reconstruction, the laparoscopic delay was carried on an outside basis where they were discharged in the evening on Tylenol 500 mg P.O. q 3 hours P.R.N. for three days. None of them complained of any excessive discomfort or pain.

The average operative time for the laparoscopic delay of the deep system and inguinal skin incisions for ligation of the superficial epigastric system ranged between 21 to 28 minutes, with an average of 26 minutes. The total blood loss in all patients was negligible with no infection in any of our patients.

Although this is a small series of ten patients, it is a select group that is very liable for total or partial necrosis of superiorly pedicled TRAM flap reconstruction of the average non-delayed patient which varies in different series.4,5 All except two of our patients had a successful reconstruction, with complete survival of all the transferred soft tissue. The remaining two patients resumed smoking a few days after their final reconstruction. This resulted in small areas of skin and fat necrosis at the distal end of their flap that necessitated secondary debridement by wedge resection and closure under local anesthesia as an office procedure with complete healing.

**DISCUSSION**

It is not known how well the superior epigastric system can maintain blood flow on both cutaneous sides of the TRAM flap after the inferior epigastric vessels have been ligated.7 One of the most common complications after pedicled TRAM flap operations is partial skin necrosis, which varies from 2-28%, depending on the review.8-10

Many attempts have been made to find ways and means to predict and augment blood supply of the superiorly pedicled TRAM flap. Chidylo et al.3 found the application of duplex ultrasonography in preoperative evaluation to be very useful. Hidalgo et al.11 found that continuous intraarterial infusion of prostaglandin E1 and heparin was helpful in extending and improving the survival of pedicled musculocutaneous flaps.

The intraoperative study performed by Harris et al.,12 which was done to establish the functional and quantitative properties of the blood supply to the TRAM flap through assessment and manipulation of blood flow through the deep epigastric arterial system, revealed that survival of the lower TRAM flap tissues requires reversal in the normal direction of arterial flow to the flap. Restifo et al. have shown in their lab and clinical studies that one week following the delay procedure the superior deep epigastric artery diameter increased significantly.5

Similar to other procedures in general surgery (i.e., cholecystectomy, appendectomy, herniorraphy, etc.) we feel that laparoscopic delay has opened a new horizon for high risk patients like ours because no major incisions were needed and no retraction on the muscles was required–thus, minimal postoperative pain was the rule.

In addition to the short operative time that decreased as more experience followed with each procedure, we were able to perform the delay procedure using one medial port of entry to approach both deep inferior epigastric vessels, thereby eliminating one of the abdominal incisions in the open delay procedure.

We find more surgical ease in using the laparoscope in harvesting the deep inferior epigastric vessels as close as possible to the iliac vessels. This is not possible in the open technique without widening our surgical incisions and using excessive medial retraction on the recti causing the patient more postoperative pain and morbidity.

**CONCLUSION**

In our group of high risk patients, laparoscopic delay of the deep inferior epigastric vessels of a superiorly based TRAM flap for breast reconstruction has offered us a short, minimally invasive procedure that is safe and more practical than the “open” procedure. We recognize that the efficacy of the delay itself is the same whether the laparoscopic or
the open techniques are used; however, we have observed much less pain and morbidity in our patients because of shorter operative time, less muscle retraction, and ease of execution of the procedure—with no added cost to the patient.

The limited partial skin and fat necrosis of the distal end of the flap did not significantly affect the final outcome of the reconstruction and did not add a major surgical intervention.

References:

1. Elliott LF, Beegle PH Jr, Hartrampf CR Jr, Bennett GK. Breast reconstruction following mastectomy: an update. J Med Assoc Ga. 1991;80(11):607-615.

2. Hallock GG, Altobelli JA. Assessment of TRAM flap perfusion using laser Doppler flowmetry: an adjunct to microvascular augmentation. Ann Plast Surg. 1992;29(2):122-127.

3. Chidyllo SA, Jacobs JS. The application duplex ultrasonography in the preoperative evaluation of patients prior to TRAM flap reconstruction letters. Plast Reconstr Surg. 1993;92(1):174-175.

4. Matsuo K, Kushima H, Nogouchi M, Sakaguchi Y, Fujiwara T. Continuous intraarterial infusion of prostaglandin E1 and heparin to extend and improve the survival of pedicled musculocutaneous flaps through unusual routes: a clinical preliminary report. Ann Plast Surg. 1992;29(4):314-320.

5. Restifo RJ, Word BA, Scout LM, Brown JM, Taylor KJW. Timing, magnitude and utility of surgical delay in TRAM Flap I & II. Plast Reconstr Surg. 1997;99:1211-1223.

6. Hartrampf CR, Scheffan M, Black PW. Breast reconstruction with a transverse abdominal island flap. Plast Reconstr Surg. 1982;69:216.

7. Tuominen HP, Asko-Seljavaara S, Svartling NE, Harma MA. Cutaneous blood flow in the TRAM flap. Br J Plast Surg. 1992;45(4):261-269.

8. McCraw JB, CE, Grossman JAI, Kaplan I, McMellin A. An early appraisal of the methods of tissue expansion and transverse rectus abdominis musculocutaneous flap in reconstruction of the breast following mastectomy. Ann Plast Surg. 1987;18:93.

9. Petit JY, Rigaut L, Gareer W, Michel G, Lehmann, A. Breast reconstruction without implant: experience of 52 cases. Eur J Surg Oncol. 1987;13:219.

10. Slavin SA, Goldwyn RM. The midabdominal rectus abdominis myocutaneous flap: review of 236 flaps. Plast Reconstr Surg. 1988;81:189.

11. Hidalgo DA, Zenn MR, Marcove RC. Aesthetic reconstruction of Tikhoff-Linberg shoulder defects with a dual-pedicle TRAM free flap. Plast Reconstr Surg. 1993;91(7):1340-1343.

12. Harris NR 2d, Webb MS, May JW Jr. Intraoperative physiologic blood flow studies in the TRAM flap. Plast Reconstr Surg. 1992;4(5):553-558; discussion 559-661.