

Atlas of

RECONSTRUCTIVE BREAST SURGERY

Lee L. Q. **Pu**

Nolan S. **Karp**



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Foreword

Drs. Pu and Karp have put together a really comprehensive book that covers the full gamut of reconstructive breast surgery. The book is beautifully illustrated and comes with some excellent videos illustrating how these procedures are done. The layout of the chapters is consistent, first covering the information that everyone needs: indications, anatomy surgical technique etc. Each chapter has case examples that illustrate the points made in the first part of the chapter and is really a good way for the reader to get to understand the indications for each procedure. Most importantly, common complications are dealt with. This book

is a treasure trove for trainees but also for any established surgeon who includes breast reconstruction in their practice. Drs Pu and Karp are truly to be congratulated. They have gathered a who's who of breast reconstructive surgeons from around the world to contribute to this book and this is reflected in the quality of the chapters. From experience I know that this is not an easy task and is sometimes akin to herding cats. With this work the cats are truly in the pen.

Peter Neligan, MB, FRCS(I), FRCSC, FACS

Preface

Breast reconstruction is a common surgical procedure performed by many plastic surgeons around the world. It is an essential part of reconstructive breast surgery and good outcomes benefit many women with significant improvement in the quality of their lives after partial or total mastectomy for cancer. Many plastic surgeons, including both editors, started their careers by doing breast reconstruction and have gained extensive clinical experience over the years.

Although there are many published books on breast reconstruction, most books are either too extensive or not comprehensive enough. Because of the increased incidence of breast reconstructive surgery, many plastic surgeons have focused their clinical practice on this area. For this reason, there is a need to create an atlas of reconstructive breast surgery that is not too extensive, but comprehensive enough, to cover all contemporary breast reconstructive surgery.

In 2017 both editors were approached by a world-renowned medical publisher, Elsevier, to create an atlas of reconstructive breast surgery. We were asked to put together such an atlas that would be relatively handy and can be used worldwide by busy plastic surgeons for their daily practices in breast reconstruction. With these goals in mind, we have selected many international experts in breast reconstruction who have been at the forefront of breast reconstructive surgery. We have put together a 24-chapter atlas on reconstructive breast surgery that should be a good reference for most reconstructive breast surgeons.

In this atlas, we have eight chapters that focus on autologous breast reconstruction. Among these are chapters on free TRAM flaps, free muscle-sparing TRAM flaps, and DIEP flaps, the three primary work horses. In addition, advanced microsurgical breast reconstruction is presented including SIEA flaps, gluteal artery perforator flaps, profound artery perforator flaps, and transverse upper gracilis flaps. The traditional pedicled TRAM flap and latissimus dorsi flap are also included in this atlas. However, patient selection and the techniques for those traditional breast reconstructions have been updated. There are 6 chapters that focus on implant-based breast reconstructions. These

include chapters on one-stage immediate breast reconstruction, two-stage immediate breast reconstruction with ADM, and two-stage immediate breast reconstruction with total muscle coverage. A chapter on pre-pectoral implant breast reconstruction is also presented. As is a chapter on traditional two-staged delayed implant breast reconstruction. There is a chapter focusing on revision of implant-based breast reconstruction as well. Three chapters on partial breast reconstruction with flaps, local tissue rearrangement, and other breast surgical procedures are presented. Because symmetry is so essential in breast reconstruction, one chapter is devoted to describing the important symmetry procedures. Fat grafting for total breast reconstruction is an emerging procedure and included as a chapter as well. Fat grafting as an adjunct procedure in breast reconstruction is also included. There chapters on nipple/areolar complex reconstruction, an important part of breast reconstruction, and nipple sparing mastectomy, an increasingly popular procedure. The last two chapters contribute to correction of two of the most common congenital breast deformities: Poland syndrome and tuberous breast deformity.

Each chapter has a standard format and is relatively easy to read and follow. The chapters are well illustrated, with videos of some of the procedures provided.

We have tried our best to put together a comprehensive but concise atlas of reconstructive breast surgery. It would be an excellent reference book for plastic surgery trainees, young plastic surgeons in practice, or even senior plastic surgeons who just want to learn more contemporary techniques in breast reconstruction. It is our ultimate goal to provide an atlas that contains the most cutting-edge procedures in breast reconstruction and to improve overall outcomes of breast reconstruction. We sincerely hope that you would enjoy reading this atlas and find it useful in your busy clinical practice. We also hope that it would be able to benefit greatly to your patients.

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My sincere appreciation also goes to all contributors of this atlas. Because of their clinical expertise, hard work, and desire to achieve excellency in reconstructive breast, we are able to put together such an atlas of reconstructive breast surgery. Without the contributions from those renowned experts, we would not be able to publish such a unique atlas in plastic surgery.

I wish to express my gratitude to Belinda Kuhn and her entire publishing team. Belinda is an incredible woman who can deliver unparalleled service in medical publishing. Under her leadership, this book project started with the table of contents, invitation to the contributors, editing and re-editing, until it has been well done. It has been a pleasure and a privilege to work with Belinda and her publishing team. They have ensured the best possible quality of each chapter and this atlas could not be successful without the effort and hard work by such an excellent team.

I have been very fortunate to hold a full-time academic position at the University of California Davis, in Sacramento, California. This renowned institution has superb faculty, staffs, and residents. Many of my former and current faculty associates have created an intellectually stimulating environment for me to write and edit such an atlas in plastic surgery. Many of my former and current faculty colleagues have helped me to cover my patients while I was concentrating on writing the chapters or away to go to the meetings. I would like to thank my current administrative assistant, Mrs. Delia Luna, who has provided me with tireless administrative support in preparation of manuscripts for the atlas.

Lastly, I wish to express my heartfelt gratitude to my wife, Yu-Shan (Emily), who has supported me for all these years of my academic career, and has kept everything in order at home so that I can concentrate on my work for this project in the late evenings and weekends, to my sons, Felix, Dustin, and Adrian, who have taught me the joy of

life outside of work, and my younger brother, Lijun (Leo), who has always encouraged me to take a difficult task. I also wish to express my gratitude and respect to my former professors and training program directors, Dr. Zhong-Gao Wang, Dr. James F. Symes, Dr. Marvin A. McMillan, and Dr. Thomas J. Krizek. With their inspiration and support, I have been able to successfully edit such an atlas in plastic surgery. In addition, I also wish to express my gratitude to my worldwide friends and colleagues in plastic surgery who have encouraged and supported me during this book project.

Lee L.Q. Pu

I would like to first thank Dr. Lee L.Q. Pu for seeing the need for an Atlas devoted exclusively to breast reconstruction. I appreciate the opportunity that he selected me to be his co-editor on this amazing project. It has been a pleasure for me to work with Dr. Pu on this book for the past three years. Dr. Pu is an internationally recognized plastic surgeon with multiple areas of expertise and experience. He is a true world traveler and educator who is invited to teach and lecture globally.

In addition, I would like to thank all of the contributors to this atlas. Each person is extremely busy both clinically and academically. I truly appreciate the time and effort put into writing and illustrating their chapters. These contributions have resulted in a truly unique resource that will hopefully be used worldwide to advance the field of breast reconstruction.

For the past 36 years, first as a house officer and later as faculty, I have been at NYU School of Medicine/ NYU Langone Medical Center. I have benefited from being trained and mentored by some of the real legends in surgery and plastic surgery. Their commitment to my education has allowed me to develop not only as a surgeon, but also as a person. I have had the honor to work with several generations of faculty, residents, and students who have and continue to teach me every day.

Lastly, I would like to thank my patients. Breast cancer diagnosis, treatment, and recovery is an extremely difficult process. The patients are the true heroes. Breast reconstruction can be the positive side of what is frequently a very challenging time. We help restore body image and dignity. I appreciate the opportunity to be my patients doctor and surgeon and to help them navigate this through this process.

Nolan S. Karp

Dedication

To my wife, Yu-Shan (Emily) and my children Felix, Dustin, and Adrian whose love, sacrifices, understanding, and unselfish support have made editing and writing this book possible.

To my parents and my younger brother who have supported me for all these years and have trusted me to pursue my dream to become an excellent academic surgeon through more than a decade's effort.

To my professors and teachers who inspired me throughout my surgical education to set up a higher standard in my career and to work harder to achieve it.

To my worldwide friends and colleagues in plastic surgery who have made so many remarkable contributions to our specialty and have consistently encouraged me to do the same.

Lee L.Q. Pu

To my wife, Joyce and my children Justin and Jenna whose love and unselfish support has made my academic and clinical work as a plastic surgeon possible for so many years.

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To my colleagues, residents, and students at NYU School of Medicine/ NYU Langone Medical Center who have taught me so much and have allowed me to develop as a person and as a doctor.

Nolan S. Karp

1

Breast Reconstruction With the Pedicled Transverse Rectus Abdominis Musculocutaneous (TRAM) Flap

CHAD M. BAILEY AND LEE L.Q. PU

▶ Introduction

Pedicled transverse rectus abdominis musculocutaneous (TRAM) breast reconstruction has been performed in patients for nearly four decades now. Many technical modifications have developed since Dr. Hartrampf's first operation, and these strategies have improved our ability to offer this operation to our patients while minimizing morbidity.

Plastic surgeons continue to perform pedicled TRAM flaps on a frequent basis.¹ The choice to perform a pedicled TRAM flap is typically multifactorial, contingent on the presence or absence of microsurgical expertise, capability, comfort with the procedure and, if applicable, the patient's desire to avoid or ability to tolerate a prolonged operation.²

The goal of autologous breast reconstruction is to reconstruct the breast with minimal morbidity while maximizing reconstructive result. In this chapter, the authors describe their preferred techniques for pedicled TRAM flap breast reconstruction, emphasizing several refinements so that a good outcome of the reconstruction with minimal abdominal donor-site morbidity can still be accomplished. In addition, patient selection, preoperative evaluation, management of complications, and secondary procedures are also described.

Indications and Contraindications

Unilateral pedicled TRAM flap breast reconstruction can be offered to patients with BMI <30 who desire autologous breast reconstruction and who have adequate lower abdominal adipose tissue and skin laxity, with a few anatomic contraindications. Ipsilateral Kocher or complete subcostal incisions disrupt the direct and collateral blood flow to the rectus abdominis muscle, and serve as absolute contraindications to pedicled TRAM breast reconstruction. Patients without those incisions and with adequate abdominal tissue who desire to avoid the risks associated with extended

operations can also be considered for pedicled TRAM breast reconstruction. Patients with low midline abdominal scars can still be considered for unilateral hemi-TRAM flap or bi-pedicled TRAM flap.³

Preoperative Evaluation and Special Considerations

Medically acceptable candidates for abdominally based autologous breast reconstruction must have adequate excess abdominal adipose tissue for reconstructed breast size and excess abdominal skin for primary closure of the donor site (Fig. 1.1). This is best determined by performing a pinch test with the patient in supine position with both knees moderately flexed. If the patient is large breasted, she should understand the inevitable need for symmetry procedure(s) to reduce the size of the contralateral breast as well as the possibility of requiring an implant in addition to the pedicled TRAM flap to achieve a symmetric result.

Abdominal scarring patterns must also be thoroughly considered and reviewed with the patient. As discussed above, a low midline abdominal scar does not prevent the use of a unilateral pedicled TRAM; however, the patient can be offered a hemi-TRAM flap, a bi-pedicled TRAM flap, or a hemi-TRAM flap with a unilateral free TRAM or deep inferior epigastric perforator (DIEP) flap to achieve adequate sized reconstruction.⁴

It is imperative to consider the patient's level of activity preoperatively. In considering pedicled TRAM reconstruction, it remains possible that physically active patients will have noticeable abdominal weakness, and could be more prone to develop bulging and hernias, though the evidence-based literature remains inconclusive on the topic.

Other important areas of consideration that will allow for adequate surgical planning are evaluation of rectus diastasis, typically best assessed on preoperative CT or MRI

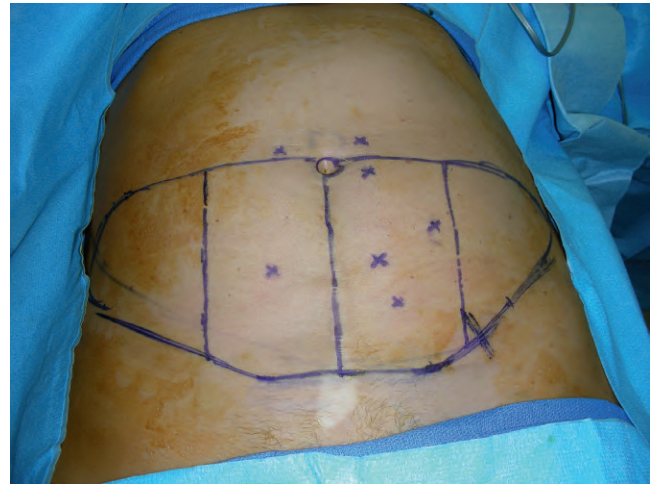


• **Fig. 1.1** A typical patient for the pedicled TRAM flap breast reconstruction. She has adequate lower abdominal tissue for a unilateral breast reconstruction.

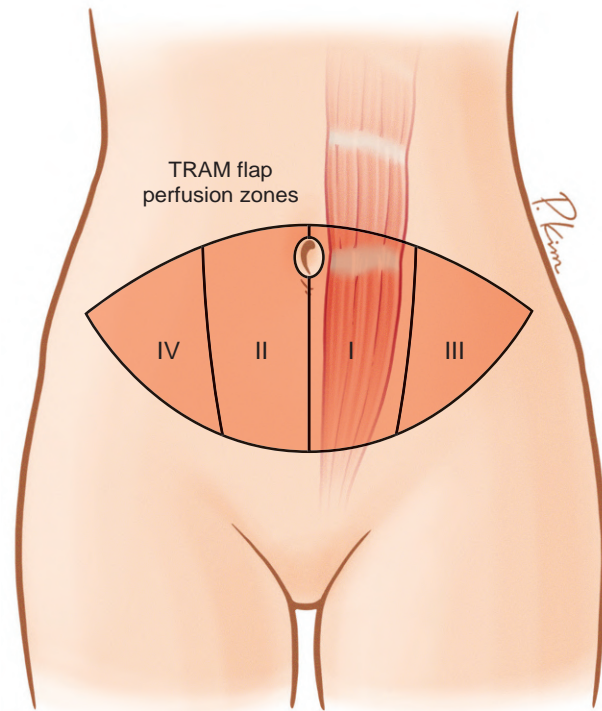
imaging; this can also be reasonably assessed while having the patient flex their trunk on the examination table and asking them to “lift your shoulders off the table.” Ventral and umbilical hernias, though difficult to detect in patients that have more abdominal tissue, must be screened for through physical examination.

Based on what we have learned to perform the free DIEP flap, the senior author prefers to evaluate the number of abdominal perforators and their locations and flow status immediately prior to the operation.⁵ This is done via duplex scanning in the preoperative holding area with both the vascular lab technician and the surgeon present to assist with preoperative marking. This has led to significant intraoperative time savings as well as increased confidence of side and perforator dominance, resulting in increased flap perfusion, decreased fat necrosis, and decreased need for the amount of rectus fascia that will be included with the flap dissection. In a unilateral pedicled TRAM flap for breast reconstruction, this allows the surgeon to select a better flap, based on the number of perforators and their locations and flow status, so a preferred side of the flap can be selected as the surgeon would do for a free DIEP flap (Fig. 1.2).

Due to the secondary and retrograde venous drainage provided by the superior epigastric vessels, pedicled TRAM flaps have indeed been associated with higher rates of fat necrosis, which is the rationale behind the Hartrampf zone classification⁶ (Fig. 1.3). In a unilateral reconstruction, this can be minimized by eliminating zone IV and portions of zone III. If a larger amount of flap tissue is needed for breast reconstruction or for smokers, a surgical delay procedure can be performed one to three weeks prior to the TRAM flap elevation so that its ischemic complications can be minimized.⁷



• **Fig. 1.2** Perforator anatomy as demonstrated by preoperative duplex scanning. In this patient, her left side has more prominent perforators and can be selected as the side for flap elevation.

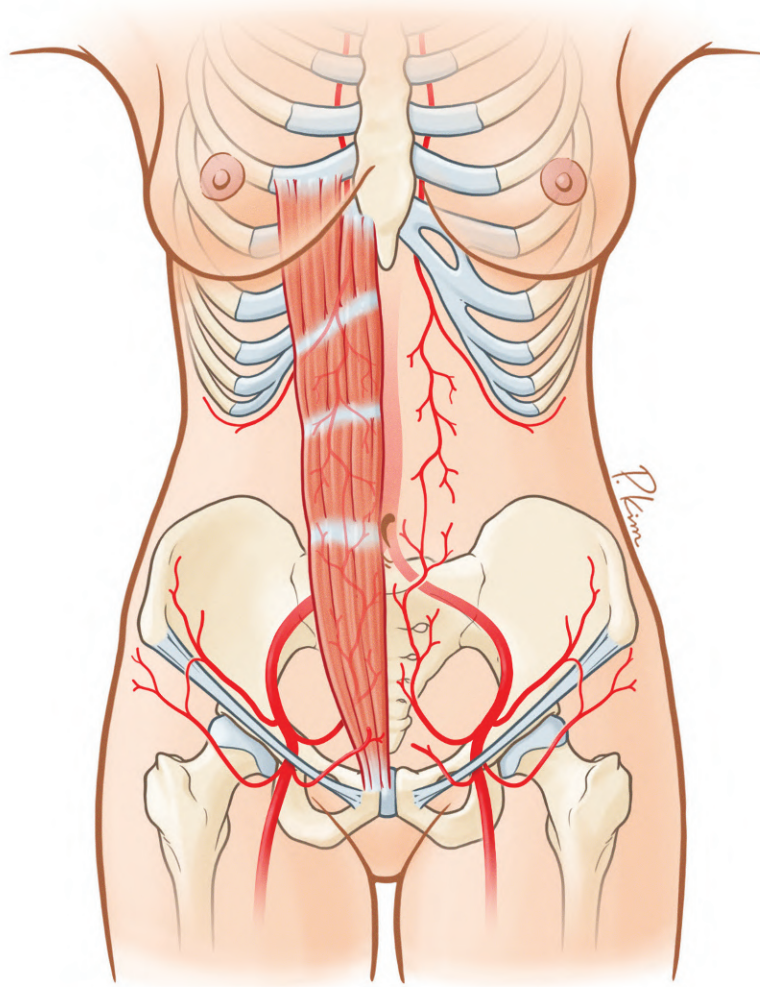


• **Fig. 1.3** A schematic diagram showing the Hartrampf zones of perfusion after elevation of the pedicled TRAM flap. Clearly, zone I has the best blood supply followed by zone II and zone III. Zone IV has the least adequate blood supply and may not be reliable.

Surgical Techniques

Relevant Anatomy

In the virgin abdomen, the dominant arterial inflow to one side of the abdominal skin is the deep inferior epigastric artery. In the majority of patients, there are three branching patterns that are relevant when performing perforator or



• **Fig. 1.4** A schematic diagram showing the dual blood supply to the rectus abdominis muscle. In a pedicled TRAM flap, the superior epigastric artery becomes a dominant pedicle after the inferior epigastric artery is divided during the flap elevation.

muscle-sparing (MS-)TRAM reconstructions. However, for the pedicled TRAM flap, the dominant arterial inflow is the superficial inferior epigastric artery (Fig. 1.4). Its venous outflow is accompanied to the artery and because the inferior epigastric vein is the dominant drainage system for the flap, it can be preserved to allow supplemental venous drainage for supercharge if needed.^{8,9}

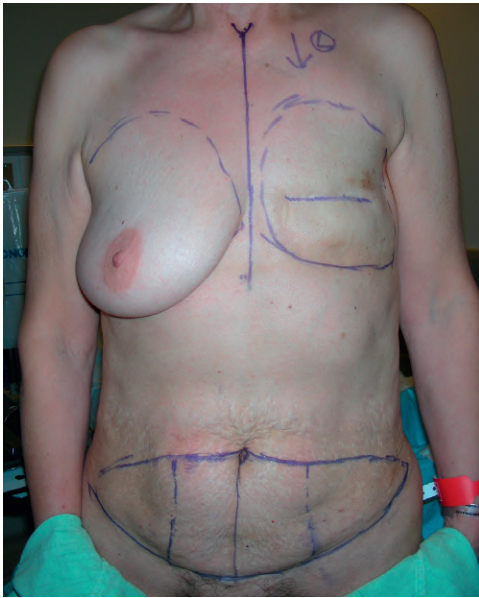
More relevant to the pedicled TRAM procedure are rectus inscriptions, which must be treated with meticulous technique as they run intimately across the epigastric artery arcade. Typically there exist three inscriptions, two of which will usually be encountered during the pedicled TRAM dissection. Should a pedicle vessel be injured, the flap may have enough collateral inflow to continue with the procedure based on the branching patterns previously referred to.¹⁰

It is imperative to be aware of and respect the arcuate line when harvesting the inferior aspect of the rectus muscle. Below the arcuate line (typically below the level of the iliac crests) there is no posterior rectus fascia. Imperfect

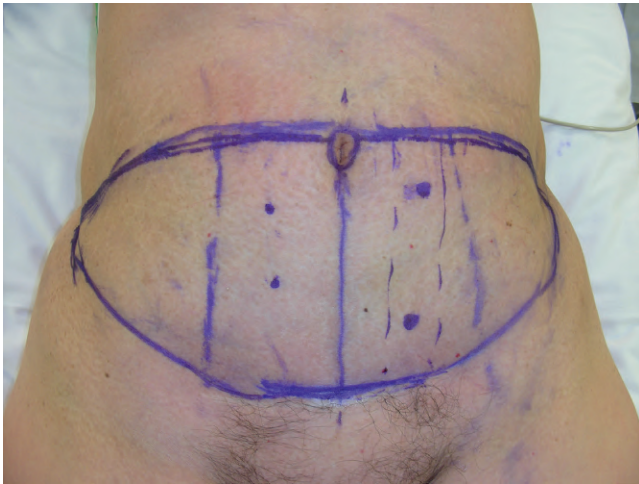
dissection posterior to the rectus muscle below the arcuate line can unnecessarily result in exposure of bowel contents and peritoneal fluid, causing additional strife and morbidity postoperatively.

Preoperative Markings

With the patient in standing position, the midline from umbilicus to pubic symphysis is marked. Next the inferior aspect of the flap is marked. The lateral extension of our inferior marking is frequently taken out into a natural skin crease but can be higher if we feel the need to move the flap superiorly. The superior aspect of the flap is then marked based on a pinch test in the lower abdomen with the understanding that this will be adjusted in the operating room (Fig. 1.5). The lateral border of the rectus abdominis muscle on each side is marked and based on the side of the selection for the flap and the location of perforators, the extent of fascial inclusion can also be marked (Fig. 1.6).



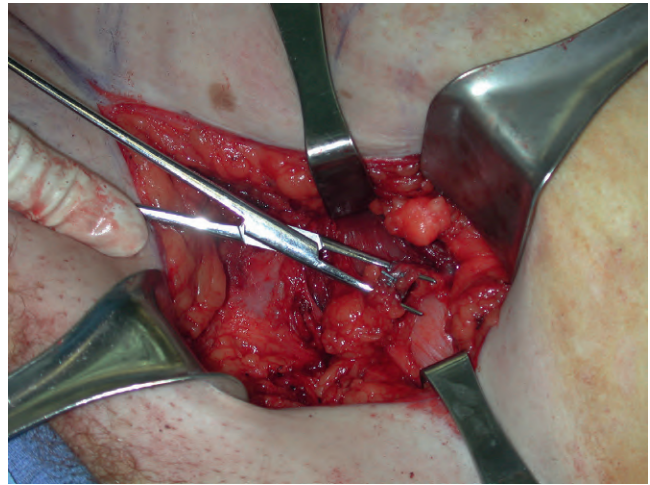
• **Fig. 1.5** An example of preoperative marking for a delayed breast reconstruction with a pedicled TRAM flap. The previous mastectomy site is also marked, and the breast skin pocket will be re-created.



• **Fig. 1.6** An example of preoperative marking for a unilateral pedicled TRAM flap breast reconstruction. The lateral border of the rectus abdominis muscle and the midline are marked. The amount of rectus fascia (outlined with the dashed line) that will be included with the flap is also marked based on the dominant perforator anatomy of the selected side.

Surgical Delay Prior to Flap Elevation

If the flap delay is indicated, the procedure can be performed under general anesthesia at a minimum of two weeks prior to the planned procedure to minimize the combined effects of two general anesthetics.^{7,11} It is imperative that all markings described above are made at the time of the initial procedure to ensure the incisions employed during the delay procedure can be incorporated during the flap elevation. The deep inferior epigastric vessels, after



• **Fig. 1.7** An intraoperative view showing the procedure of surgical flap delay. In this case, the inferior epigastric artery and vein are dissected free with the forceps and will then be divided with hemoclips.

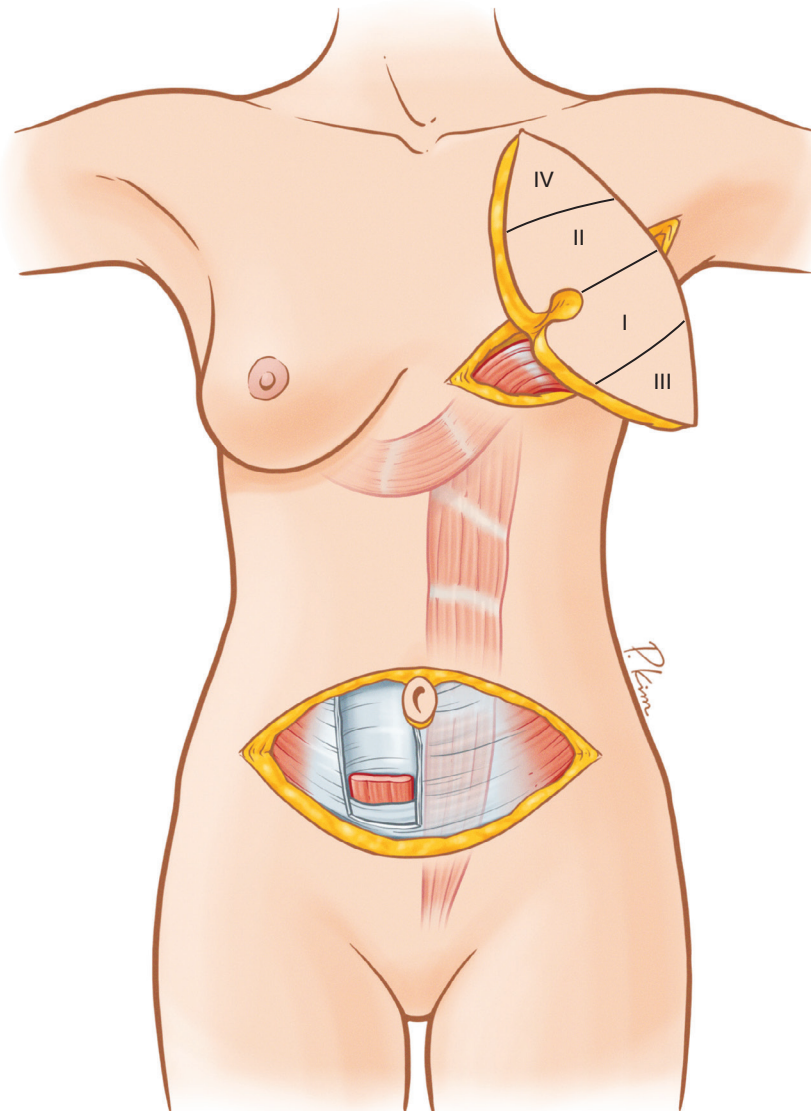
adequate exposure, are divided during the delay procedure (Fig. 1.7).

Flap Elevation

Unilateral

The umbilicus is first dissected free with preservation of adequate fat around it and down to the anterior rectus sheath. The TRAM flap skin paddle is then incised but beveled superiorly and inferiorly in the zone I and zone II areas to catch more flap tissue. Once the superficial inferior epigastric vessels are identified in each side, they are divided with hemoclips. From the non-flap side, the suprafascial dissection can be quickly done to about 1 cm beyond the midline. On the flap side, the suprafascial dissection is done towards the lateral border of the rectus abdominis muscle. The fascial incision is safely performed about 1–2 cm beyond the midline and about 2 cm medial to the lateral border of the rectus muscle. The dissection is taken down to elevate the entire rectus muscle in the lower part of the abdomen. During dissection, the inferior epigastric vessels under the muscle are identified and incorporated with the flap. The distal portion of the rectus abdominis muscle is then divided with protection of the inferior epigastric vessels. Once the muscle is divided inferiorly, the inferior epigastric artery and the vein are easily identified. The artery is divided with hemoclips but the vein is divided with hemoclips placed on the proximal end. The distal end of the vein is left open for temporary drainage throughout the case and will be clipped before the final flap inset.

The TRAM flap is then dissected free and elevated easily above the posterior rectus sheath. The superior epigastric vessels are identified within the deep surface of the flap and marked clearly with a marking pen. The superior abdominal skin is elevated to the xiphoid and an incision over the



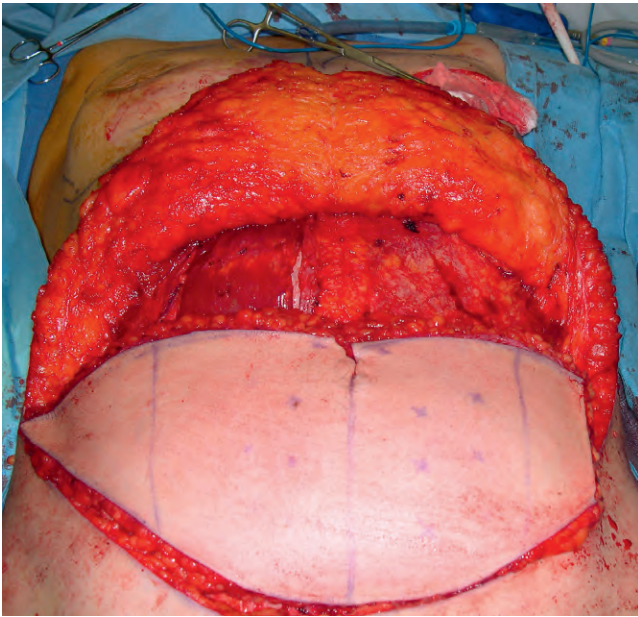
• **Fig. 1.8** A schematic diagram showing the TRAM flap inset. The flap can be tunneled contralaterally or ipsilaterally and orientated vertically or obliquely.

anterior rectus sheath is then extended to the level of the subcostal margin. All inscriptions in the superior part of the rectus muscle are dissected free and near the costal margin, the lateral part of the muscle is divided off the lateral costal margin to allow for more mobilization and a tension-free inset of the flap. A subcutaneous tunnel is made between the breast pocket and the upper abdomen (Fig. 1.8). The portion or entire zone IV of the flap is usually discarded before the flap tunneling (Fig. 1.9). The flap can be tunneled either ipsilaterally or contralaterally depending on the side of the flap selected. The tunnel should be wide enough, typically to pass through four fingers, to avoid any compression on the muscle within the tunnel. With the aid of lubricating jelly, the flap is passed through the tunnel and inset into the breast pocket. The pedicle should be checked for possible kinking and twisting and a few tacking sutures can be placed to secure the muscle so that

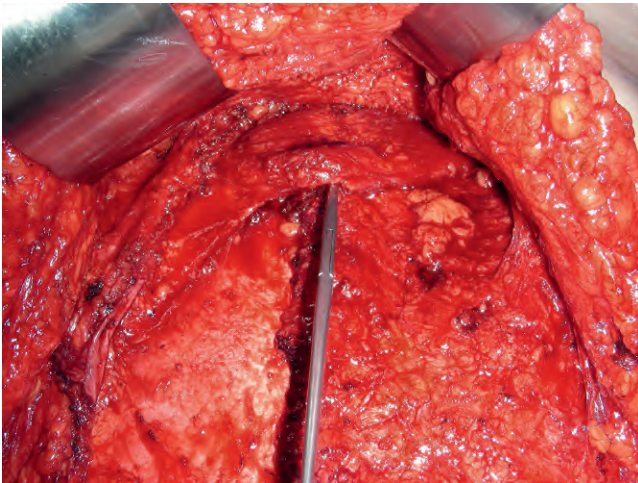
kinking and twisting of the pedicle can be further prevented (Fig. 1.10).

Bilateral

There are some differences when performing a bilateral pedicled TRAM flap compared to a unilateral procedure. The entire skin paddle of the lower abdomen is sectioned down the middle to allow for easier dissection from the midline to each medial side of the flap. We recommend midline sectioning following maximal lateral dissection, as this gives the surgeon perspective when trying to preserve specific perforators and save as much of the fascia as possible so that the size of its defect can be minimized. Once the deep inferior epigastric vessels are divided, the flap including the entire zones I and III from each side is elevated as the unilateral procedure but is tunneled ipsilaterally only (Fig. 1.11).



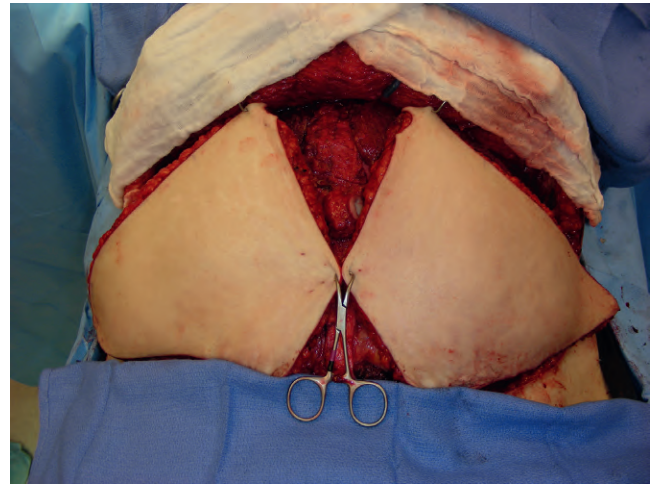
• **Fig. 1.9** An intraoperative view showing completion of the pedicled TRAM flap dissection. The portion or entire zone IV of the flap is discarded before the flap inset.



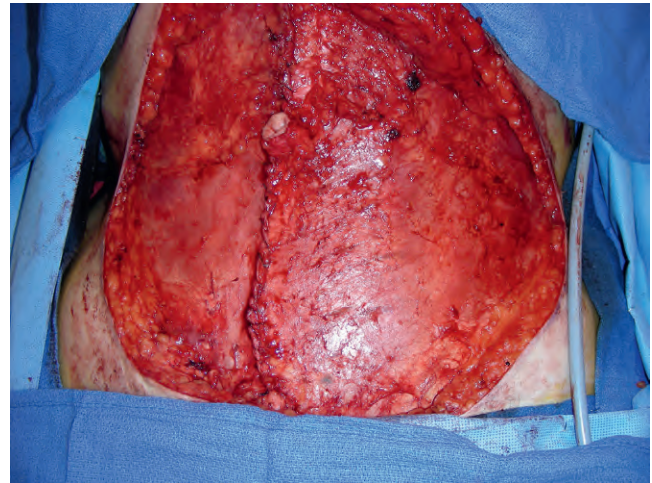
• **Fig. 1.10** An intraoperative view showing completion of tunneling for a unilateral pedicled TRAM flap after preliminary inset. The pedicle within the muscle (pointed out by a forceps) appears to remain patent without kinking or twisting.

Flap Inset

The flap is inset in an upright position. The inferior epigastric vein is clipped. Several 3-0 PDS sutures are performed to reconstruct the inframammary fold from inside the breast pocket. For unilateral TRAM flaps, the entire zone IV and part of zone III are usually discarded. For bilateral TRAM flaps, only a small portion of the zone III is discarded. The flap can be inset vertically or obliquely, and zone I should be placed in the center of the breast mound. Once the size and shape of the skin paddle are determined, the rest of the area is de-epithelialized. Additional excision of the flap



• **Fig. 1.11** An intraoperative view showing completion of the bilateral pedicled TRAM flaps. For each side, both zone I and zone III of the flap are needed for the flap inset.

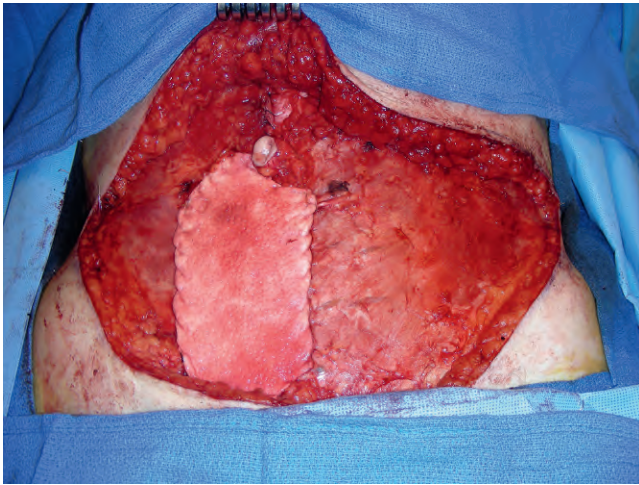


• **Fig. 1.12** An intraoperative view showing completion of the donor site closure after elevation of the pedicled TRAM flap. Since only a relatively small portion of the rectus fascia is harvested with the flap, the fascial defect can be closed primarily without difficulty.

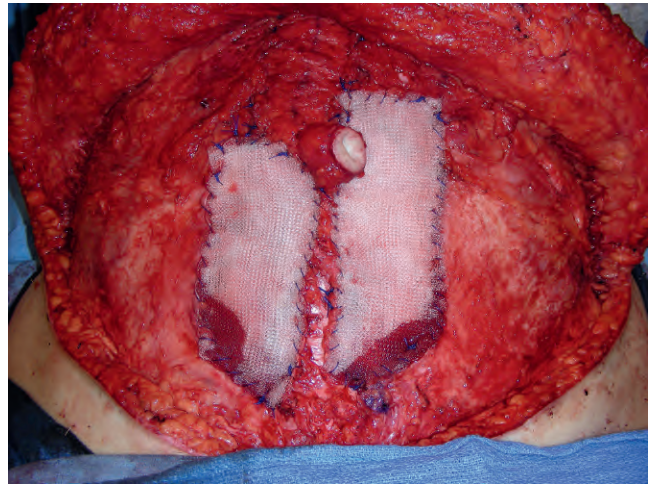
tissue can be done as needed to tailor the size and shape of the reconstructed breast. One or two drains are placed within the breast pocket under the flap. The final flap closure is then performed in two layers.

Abdominal Closure

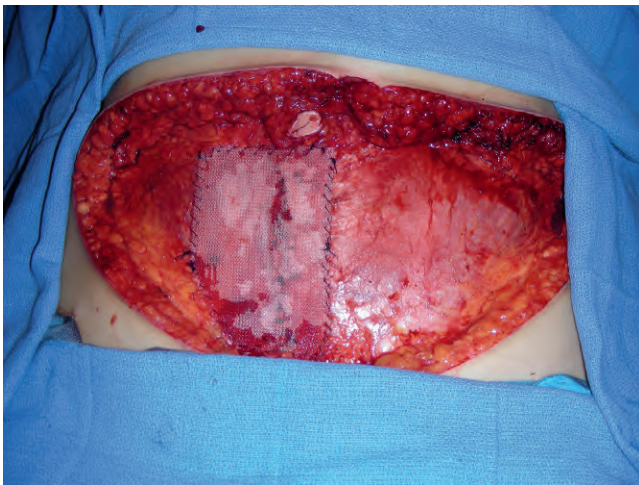
For unilateral TRAM flap donor sites, the entire length of the anterior rectus sheath is closed primarily with 2-0 Prolene suture in an interrupted figure-of-eight fashion to reduce the tension on the fascial closure followed by a 1-0 Prolene suture in a simple running fashion (Fig. 1.12). In the senior author's practice, a lower part of the fascial defect can be approximated without problem. However, a biological mesh (Fig. 1.13) or synthetic mesh (Fig. 1.14) is routinely placed as an onlay graft with 2-0 PDS sutures to reinforce lower abdominal fascial closure.



• **Fig. 1.13** An intraoperative view showing placement of an onlay biological mesh over the lower abdominal TRAM flap donor site for additional reinforcement after primary closure of the fascial defect.



• **Fig. 1.15** An intraoperative view showing placement of an inlay synthetic mesh for primary closure of the fascial defect over each abdominal donor site in a bilateral TRAM flap breast reconstruction patient.



• **Fig. 1.14** An intraoperative view showing placement of an onlay synthetic mesh over the lower abdominal TRAM flap donor site for further reinforcement after primary closure of the fascial defect.

For bilateral TRAM flap donor sites, the upper anterior rectus sheath can be closed primarily in the same way as for the closure of unilateral TRAM flap fascial defect. For the lower part of the fascial defect in each flap donor site, an inlay synthetic mesh is placed routinely to close the lower abdominal fascial defect. Because of relatively small fascial defect on each side, a large amount of inlay mesh can be avoided (**Fig. 1.15**).

The abdominal skin defect is closed as the same as abdominoplasty. More undermining of the superior abdominal skin flap can be performed as needed so that the skin defect can be accomplished with less tension. The umbilicus is brought out through the midline at the level of the superior iliac spine and inset through the skin and closed in two layers. The final abdominal skin closure is then performed in three layers (Scarpa's fascia, deep dermal, and skin) accordingly after placement of two drains under the lower abdominal skin flap.

Case Examples

CASE 1.1

A 53-year-old white woman had previous left mastectomy for breast cancer about 10 months ago and desired abdominally based autologous breast reconstruction (**Case 1.1.1**). She underwent a contralateral pedicled TRAM flap for her left breast reconstruction (**Case 1.1.2**). **Case 1.1.3** shows the immediate result after her left breast reconstruction. The abdominal fascial defect was closed primarily but also reinforced with Prolene mesh in an onlay fashion. **Case 1.1.4**

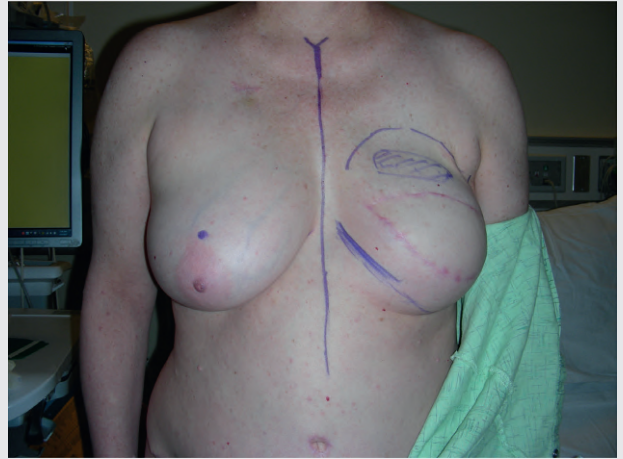
shows the result at 5 months, right before the revision of left reconstructed breast and right mastopexy for symmetry (second-stage reconstruction). **Case 1.1.5** shows the result at 4 months after her second-stage reconstruction right before the nipple/areola reconstruction. All her postoperative courses were uneventful. **Case 1.1.6** shows the result at 5 months after her nipple reconstruction, 9 months after second-stage reconstruction and 13 months after initial breast reconstruction.

Continued

CASE 1.1—cont'd



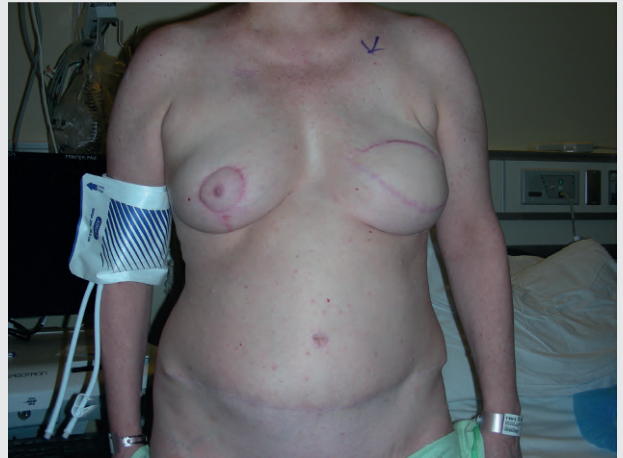
• Case 1.1.1



• Case 1.1.4



• Case 1.1.2



• Case 1.1.5



• Case 1.1.3



• Case 1.1.6

CASE 1.2

A 46-year-old white woman underwent right skin-sparing mastectomy for breast cancer and desired abdominally based autologous breast reconstruction (Case 1.2.1). She underwent immediate right breast reconstruction with a contralateral pedicled TRAM flap (Case 1.2.2). Case 1.2.3 shows the immediate result after her right breast reconstruction. The abdominal fascial defect was closed primarily. Case 1.2.4 shows the result at 10 weeks right before the revision of right reconstructed breast and left mastopexy for symmetry

(second-stage reconstruction) and Case 1.2.5 shows the immediate result after the above procedures. Case 1.2.6 shows the result at 5 months after her second-stage reconstruction right before the nipple/areola reconstruction and Case 1.2.7 shows the immediate result after her nipple reconstruction. All her postoperative courses were uneventful. The result is shown at 18 months after initial breast reconstruction (Case 1.2.8).



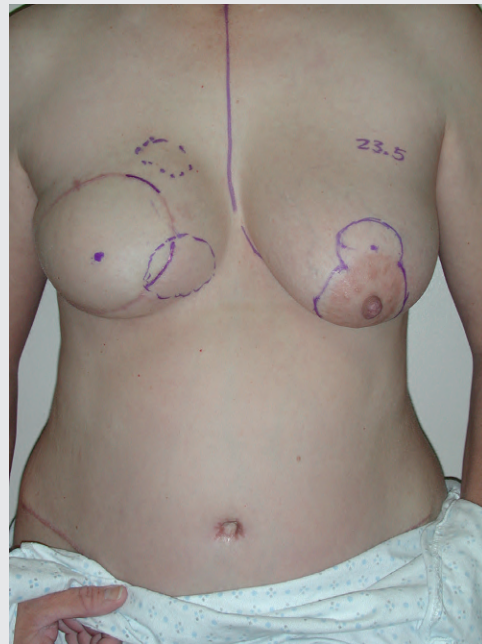
• Case 1.2.1



• Case 1.2.3



• Case 1.2.2



• Case 1.2.4

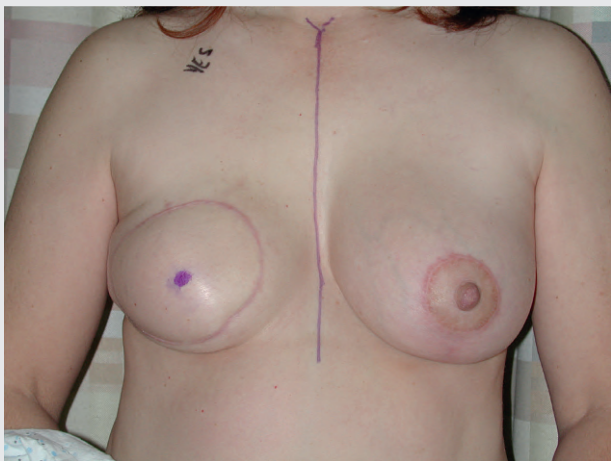
CASE 1.2—cont'd



• Case 1.2.5



• Case 1.2.7



• Case 1.2.6



• Case 1.2.8

CASE 1.3

A 44-year-old white woman underwent bilateral skin-sparing mastectomies for right breast cancer and desired abdominally based bilateral autologous breast reconstructions (Case 1.3.1). She underwent immediate bilateral breast reconstructions with two ipsilateral pedicled TRAM flaps (Case 1.3.2). Case 1.3.3 shows the immediate result after her bilateral breast reconstructions. Each side of the abdominal fascial defect was closed primarily with Prolene mesh in an inlay fashion. Case

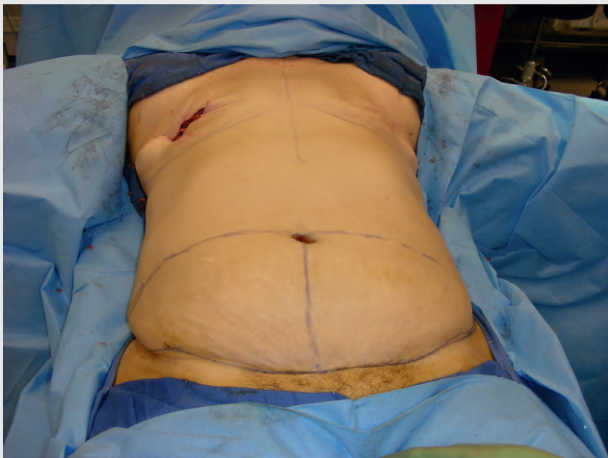
1.3.4 shows the result at 8 months after initial breast reconstruction. She subsequently underwent bilateral nipple/areola reconstructions and revision of right reconstructive breast including fat grafting and the immediate result is shown in Case 1.3.5. All her postoperative courses were uneventful. Case 1.3.6 shows the result at 8 months after her nipple reconstruction and 18 months after initial breast reconstruction.



• Case 1.3.1



• Case 1.3.4



• Case 1.3.2



• Case 1.3.5



• Case 1.3.3



• Case 1.3.6

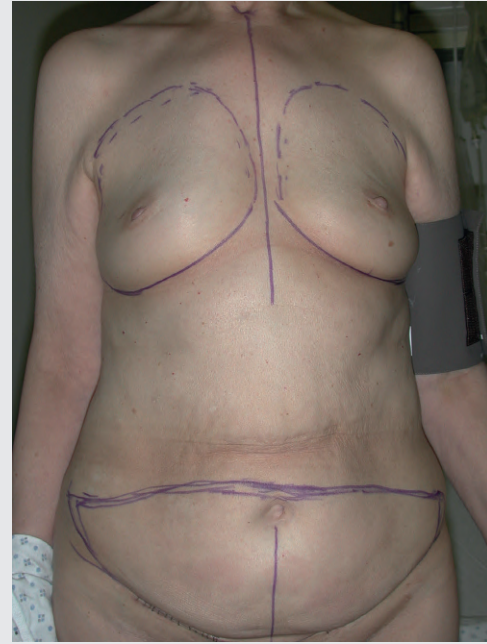
CASE 1.4

A 63-year-old white woman underwent prophylactic bilateral skin-sparing mastectomy and desired abdominally based bilateral autologous breast reconstructions (Case 1.4.1). Because she was a smoker, the surgical flap delay was performed for each side 2 weeks before bilateral mastectomies (Case 1.4.2). She underwent immediate bilateral breast reconstructions with two ipsilateral pedicled TRAM flaps (Case 1.4.3). Each side of the abdominal fascial defect was repaired

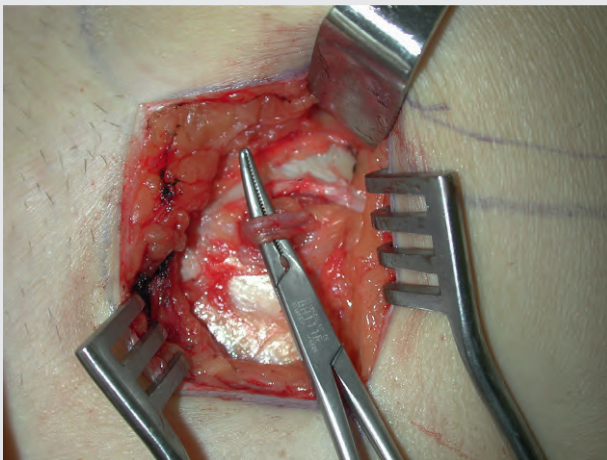
with Prolene mesh in an inlay fashion. The immediate result after her bilateral breast reconstructions is shown in Case 1.4.4. She subsequently underwent bilateral nipple/areola reconstructions and the result at 6 months after her nipple reconstruction is shown in Case 1.4.5. All her postoperative courses were uneventful. The result is shown at 6 months after her nipple reconstruction and 15 months after initial breast reconstruction (Case 1.4.6).



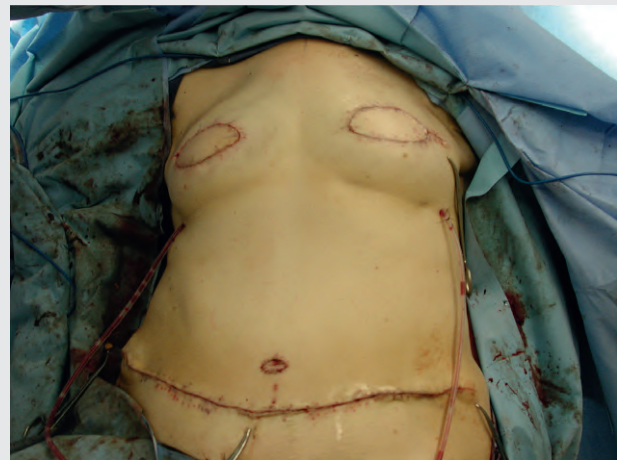
• Case 1.4.1



• Case 1.4.3



• Case 1.4.2



• Case 1.4.4

CASE 1.4—cont'd



• Case 1.4.5



• Case 1.4.6

Postoperative Care and Expected Outcomes

Postoperative care for pedicled TRAM flap breast reconstruction is similar to care following a major flap reconstruction. The patient is kept warm and well hydrated with good pain control. The flap is monitored clinically, and an abdominal binder is placed for support. The patient is encouraged to ambulate earlier. Once the patient tolerates oral intake and pain control is adequate with oral medications, she can be discharged home. In general, a 3- to 5-day hospital stay is needed depending on the speed of the patient's recovery. Drains are removed when the output is < 30 cc/day for 2 consecutive days during follow-up. Activity is limited to lifting of no more than 5 lbs (2.25 kg) for 6 weeks postoperatively and the patient can resume all her normal activities after 6 weeks.

Good to excellent breast reconstruction can be achieved if there are no surgical complications related to the flap or abdominal donor site. Primary healing can be expected in 3 weeks and the patient should feel normal after close to 6 weeks of recovery. Complications such as partial flap loss, flap fat necrosis and abdominal wound healing problems may occur and should be managed properly. In addition, flap contour deformity, symmetry issues related to the contralateral breast, or bulging in the abdominal donor site can be managed through re-operations.

Management of Complications

Partial flap loss can be managed with superficial debridement or more extensive excision of necrotic flap tissue. If a significant portion of flap tissue will be removed (Fig. 1.16A), a pedicled latissimus dorsi musculocutaneous flap can be performed as a salvage procedure for breast reconstruction (Fig. 1.16B).

Fat necrosis can be a common problem for a pedicled TRAM flap breast reconstruction.² If fat necrosis is localized and palpable, direct excision is our preferred method during revision surgery for the reconstructed breast. If contour deformity after excision of fat necrosis becomes obvious, fat grafting or reshaping of the breast skin envelope can be performed.

Abdominal skin flap necrosis can cause delayed wound healing in some patients and can be managed with adequate debridement and local wound care. If the size of skin flap necrosis is more extensive, vacuum-assisted closure (VAC) can play a role after proper wound debridement. In general, a skin graft is rarely needed for the above condition.

Secondary Procedures

For unilateral pedicled TRAM flap breast reconstruction, mastopexy or breast reduction is often needed for the contralateral "normal" breast as a symmetry procedure. Additional contouring procedures such as liposuction or