

# Oncoplastic and Reconstructive Breast Surgery

Second Edition

Cicero Urban  
Mario Rietjens  
Mahmoud El-Tamer  
Virgilio S. Sacchini  
*Editors*

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 Springer

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Mahmoud El-Tamer • Virgilio S. Sacchini  
Editors

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*Editors*

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*To Professor Umberto Veronesi, whose philosophy guided us to oncoplastics journey.*

*To our mentors, models of integrity and discipline for our surgical practice, and who left an indelible mark on us with their skills, creativity, and love of science and art of oncoplastic and reconstructive surgery of the breast.*

*To all the patients who allowed us to repair an important part of their lives. We got it right many times, but sometimes made unavoidable mistakes when we were not able to achieve the best outcome. This is the experience we want to share in this book, in order to help surgeons make positive decisions.*

*To our families, particularly our wives and children, for whom we want to create a better future, and try to leave a better world.*

Cicero Urban (Curitiba)  
Mario Rietjens (Milan)  
Mahmoud El-Tamer (New York)  
Virgilio S. Sacchini (New York)

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## Foreword to First Edition

Surgical management of malignant diseases represents an exemplary model of multidisciplinary management. The combined modality approach to the treatment of breast cancer patients that includes primary surgical treatment, radiation therapy, and chemotherapy needs careful integration of these modalities with the new methods of reconstructive breast cancer surgery. This book provides such a practical approach to the successful management of the disease. For this endeavor, the authors have assembled leaders in the field of oncoplastic breast surgery from around the globe to provide a truly international flavor for the reader. The content of this textbook is therefore relevant to clinicians around the world.

There are 49 chapters, with major sections covering topics ranging from the basic principles of plastic surgery to the difficulties of partial breast reconstruction, to the most advanced field of breast repair after mastectomy. Furthermore, there is a special section dealing with reconstruction in particular subgroups of patients, such as the elderly, pregnant patients, and previously irradiated patients.

The breast is the heart of femininity, and although it is often exploited for commercial reasons, it remains in the mind of every one of us as the true symbol of womanhood, with the role of nurturer, nourisher, and comforter. These gestures evoke a strong sense of affection and the importance that this delicate organ has in the minds of women, who combine the seductive aspect as well as the maternal role, of men, capturing the source of pleasure and desire, and also of children, who find satisfaction and the bond to life itself.

Here, therefore, the desire surfaces for every woman who has experienced breast cancer to rediscover pleasure in her own company, to reconcile with her own shaken femininity, offering the possibility to look in the mirror and rediscover the beauty of her own body, to develop the desire of pregnancy, to hold to the breast and nurture her own baby, and to be able to return to normal daily life, also grateful for the goals achieved by science today: increasingly more conservative surgery, with respect for women's physical and psychological integrity, and reconstructions that allow the restoration of a natural looking breast, with minimum scarring.

In conclusion, this textbook is an excellent, user-friendly guidebook for anyone who cares for or treats patients with cancer of the breast, particularly residents, fellows, and practitioners of general surgical oncology, and, for this reason, it would be a worthy addition to most surgical and oncological libraries.

Umberto Veronesi  
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## Foreword to First Edition

Surgery is still an important part of breast cancer treatment. *Oncoplastic and Reconstructive Breast Surgery* edited by Mario Rietjens and Cicero Urban is a major contribution to the surgical literature in the field of breast cancer. Although mastectomy and axillary lymph node dissection have been well-known techniques for many years, a novel approach for mastectomy should be reconsidered in the case of risk-reducing mastectomy or when a nipple-sparing mastectomy is proposed for selected breast cancers. Conservative treatment is now widely proposed in stage I and II breast cancer leading to wider glandular defects requiring immediate remodeling to avoid disabling cosmetic results. The attitude toward the axillary lymph nodes has changed in the last few years. Sentinel node techniques have been introduced successfully in patients with no tumors and can even be performed twice in cases of local recurrence after conservative treatment.

But the most recent change in breast surgery is the development of oncoplastic indications at the time of the primary surgery. A huge armamentarium of plastic surgery techniques is now available for performing immediate breast reconstruction or remodeling of the breast tissue in cases of wide tumorectomy. The technique of lipofilling represents a true revolution in plastic surgery and can be applied in many situations of breast cancer surgery, provided that statistical studies confirm the safety of the procedure in cancer patients. Indications for implants or autologous myocutaneous flaps should be discussed for each patient requiring an immediate total breast reconstruction. The most sophisticated techniques such as those using microsurgery require close collaboration between the different specialties as well as a high level of competence. This book provides an extensive description of all the techniques available today, with a most practical presentation for surgeons who want to extend their surgical knowledge. The chapters include not only details regarding surgical indications but also data about the risk of complications. The book will be extremely useful for both cancer surgeons trained in oncoplastic surgery and plastic surgeons called upon to reconstruct the breast or to improve the breast morphology after extensive tumorectomies.

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## Foreword to Second Edition

The state of the art in oncoplastic surgery is to cope with unfavorable anatomy of relative tumor size and tumor location, to challenge complex local treatments and post-radiation breast surgery, and to remove cancer without mutilation and tumor not touching ink for invasive disease and at least 10 mm in ductal intra-epithelial neoplasia (DIN). Oncoplastic surgery was not invented to extend unnecessary margins but to reduce re-excisions and recalls for distortion after prior breast conserving surgery (BCS) and to lower the rate of mastectomies to save social and medical resources.

Oncoplastic techniques are composed of aesthetic surgical interventions to solve benign, malignant, and aesthetic problems according to the individual anatomy of the breast, the culture of the given individual, and the available resources for the best treatment.

Radiotherapy is an integral part of BCS. Hence, breast conserving surgery can be considered in cases where radiotherapy is an oncological indispensable modality and the preservation of a natural breast is achievable by oncoplastic surgery. Tumor-adapted reductions represent the main purpose of OPS based on a variety of techniques by the use of local breast tissue. The local breast tissue requires RT, and hence, reductions are the ideal oncoplastic method without “jamming” of cosmetic outcome and oncology. The shifting of healthy tissue during the oncoplastic reduction dislocates the tumor bed after excision. In order to avoid a local miss of the boost, the electron IORT, in our hands by the use of in situ application before the tumor removal, is proved advantageous to an external focusing.

The experience from post-radiation surgery after BCS for recurrence or aesthetic correction led to new promising protocols of primary radiotherapy (PRT) in locally advanced breast cancer (LABC) or more difficult cases.

The leading term, tumor-specific immediate reconstruction, was given by my teacher, John Bostwick III, to define oncoplastic surgery. This leading notion opens the perspective of multiple transitions from breast conserving and partial reconstruction to conservative mastectomy and immediate or delayed total reconstruction including backup techniques after prior BCS. Due to the increasing number of breast cancer in primarily aesthetic patients after prior augmentation and cancer complicated implants, new oncoplastic techniques of implant-based breast conserving and implant-based conservative mastectomy and reconstruction have been successfully developed.

Finally, the surgical surface of the operated breast and the individual body image in the mirror after oncoplastic surgery and immediate reconstruction after conservative mastectomy are uniform and sometimes better than before together with a psychological relief from cancer trauma.

In my view, the capacious textbook written by the most experienced and skilled breast surgeons in the world will be a milestone in the establishment of an acknowledged specialization and certificate in the form of a breast surgery license to cover comprehensively oncologic, reconstructive, and aesthetic surgery of the breast. Patients affected with breast cancer, female and male, can be saved without losing their belief in body image and beauty.

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## Foreword to Second Edition

It is with great pleasure that I write these introductory comments for the second edition of this important body of work on oncoplastic surgery. Most contributors to this text have dedicated their careers to improving the surgical care of patients faced with the traumatic diagnosis of breast cancer—a unique entity and a life-changing moment for each and every patient.

Historically, the surgeon has been the “quarterback” in the breast cancer patients’ care. We must ask why, and perhaps the answer lies in the depths of history and the halls of institutions that have pioneered treatment options for many decades. Reaching far into ancient history we learn that if left untreated, breast cancer becomes a ravenous enemy of a woman’s body destroying the breasts’ shape, form, and dignity by local consumption of normal tissues engulfing the breast with fulminating spread of malignant disease. Not a pretty picture by any stretch of the imagination.

The field of oncoplastic surgery has come of age and is currently undergoing a long-awaited period of tremendous enthusiasm from surgeons around the world. For decades, surgeons met this philosophical approach to the breast cancer patient with trepidation—thinking it might compromise the surgeons’ ability to adequately treat the tumor effectively with the ominous prediction that poor patient outcomes could be the end result. However, history has proven otherwise. The few long-standing pioneers in oncoplastic surgery have proven that outcomes are not only substantiated, but in many if not most cases, patient outcomes are improved. The principles of oncoplastic surgery embrace the multidisciplinary approach with the highest standards placed upon the oncologic assessment and outcome—but without the need for total disregard and sacrifice of aesthetic principles.

Rather, oncoplastic surgery seeks the perfect blend of planning and execution of the surgical procedure(s) most appropriately aligned with multiple factors such as the patient’s personal risk factors, tumor location, histologic subtype, size, shape, contour of the breast, and most importantly, the patient’s desires. How does the patient feel about the breasts? What is their preference? Perhaps they have long awaited a breast reduction—and this would be the ideal procedure to remove a tumor in the lower pole of the breast? Or perhaps the patient has a genetic predisposition that is best treated with skin/nipple sparing mastectomy and immediate reconstruction?

In the past, the surgical management of breast cancer was judged solely on the basis of “survival rates” as the critical endpoint. However, from decades of experience we are clearly aware that in most cases, women with early breast cancer will achieve and enjoy excellent survival rates. Utilization of the oncoplastic approach to surgery facilitates a comprehensive surgical plan for most patients and ultimately will lead to improved patient outcomes that focus not only on the benefits of the oncologic treatment, but also on the benefits of achieving improved aesthetic outcomes customized to each patient in order to improve the quality of life women can enjoy for decades to come. This exciting textbook embodies the current “Renaissance Period” for oncoplastic surgery—bringing together the science and art of optimizing breast cancer treatment in an efficient, cost-effective, and humanitarian manner.

I congratulate Dr. Cicero Urban and his colleagues on their achievement once again in bringing this important body of work to surgeons around the world seeking to integrate oncoplastic techniques into their practice for the benefit of their patients. It has been my pleasure to contribute, and I hope each of you will reap the pleasure of seeing your patients not only survive but thrive throughout the years.

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## Preface to First Edition

*Non enim vivere bonum est, sed bene vivere*  
It is not well living, but living well.

Seneca

The unprecedented progress that breast surgery has experienced in the past century has led to a radical change of paradigms. It is no longer possible to dissociate aesthetic and oncology surgery. This interdisciplinary and translational feature represents a new stage for both breast surgery and plastic surgery all over the world.

Breast surgeons must have a thorough knowledge of the existing concepts in plastic surgery of the breast, as a plastic surgeon who regularly performs breast reconstruction procedures must also be familiar with oncologic principles of breast cancer surgery and keep up to date with developments in chemotherapy, hormonotherapy, radiotherapy, and monoclonal therapies which will influence surgical decisions. Many results considered unsatisfactory in reconstructive surgical procedures in the past are due to this lack of interdisciplinary understanding. Good reconstruction depends on choosing the technique that is most suitable for each patient's aesthetic-functional condition and for the oncologic and clinical factors involved. It all begins with a well-performed and properly balanced oncologic surgical procedure—radical where it needs to be, but conservative and carefully performed in order to preserve breast tissue that will improve the patient's quality of life while maintaining local control of disease.

Nevertheless, most breast cancer surgical procedures do not follow oncoplastic standards, and so patients still experience mutilation resulting from mastectomy without immediate reconstruction. It is important not simply to preserve life but also to preserve a good quality of life and to understand women in a holistic manner. The breast represents more than just its shape or function during the breast-feeding period. It is the true feminine identity itself, which goes through a period of great conflict when cancer is diagnosed. Surgery is a difficult and traumatic event that will affect one in every eight women, and it places breast cancer at the center of public health measures all over the world.

The scope of this book, with its 49 chapters written by renowned and experienced authors, is new. It approaches oncoplastic and reconstructive breast cancer surgery from the viewpoints of the fundamentals of molecular biology and breast anatomy, the basics of diagnosis and clinical therapeutics, ethics and bioethics, clinical oncology, psychology, and quality of life, evaluation of aesthetic outcomes, and oncoplastic and reconstructive techniques, which are described in detail. There is also an accompanying website where one can view videos of surgical procedures conducted by the Plastic Surgery Division of the European Institute of Oncology in Milan (Italy) and from Hospital Nossa Senhora das Graças (HNSG) Breast Unit in Curitiba (Brazil). The various surgical techniques are clearly explained and demonstrated. By such an approach, we aim to link oncologic surgical principles with aesthetic-functional and reconstructive ones, which were in opposition for many decades. The radical approach of the past is now obsolete, with the utmost effectiveness obtained with minimal mutilation. More conservative breast surgical procedures, less radical mastectomies, preservation of the axilla with the sentinel lymph node technique, less aggressive techniques (such as recently developed intraoperative radiotherapy), individualized chemotherapy and target therapies through predic-

tive factors, and more accurate prognoses are all achievements associated with the development of reconstructive techniques that are more efficient but less traumatic. They are what is today an inseparable oncologic-reconstructive-aesthetic-functional combination.

The patient, who is seen in a holistic way, doubtlessly enjoys the great benefit of this change in paradigms: physically, psychologically, and spiritually. It was exactly by bearing this thoroughness in mind that this work was designed, dedicated to all the professionals involved in breast health care and especially to surgeons. We would like to thank all the authors and colleagues who kindly and selflessly helped with the chapters, and especially Jim Hurley II, a dear friend and a skilled oncoplastic surgeon from Chambersburg (USA), for his final review of the English. We also sincerely thank and acknowledge Umberto Veronesi and Jean-Yves Petit, who have dedicated a great deal of their lifetime to patients with breast cancer and therefore have allowed women all over the world to benefit from their creativity and scientific knowledge.

Milan, Italy  
Curitiba, Brazil

Mario Rietjens  
Cicero Urban

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## Preface to Second Edition

Since the first edition of this great and successful book, significant advances have been made in oncoplastic and reconstructive breast surgery. There is no doubt anymore about the importance of preserving the breasts, symmetry, and quality of life to breast cancer patients. These principles have overlapped old prejudices and fears about combining in one surgery the goals of oncology and aesthetics.

Professor Umberto Veronesi, who wrote the foreword for the first edition, and the leader of breast conserving movement, sadly passed away in 2016. He left his legacy to new generations of breast surgeons in the twenty-first century. More, today, is not better. More radicalism, most of the time, means unnecessary mutilation and suffering to the patients. Without the consolidation of breast conserving surgery in Milan trials in the 1980s, we probably would be spending more years doing mastectomies and axillary dissections, without reconstruction. Oncoplastic concept had arisen in this fertile field in the 1990s in Europe.

The spirit of this book remains the same—to provide in-depth concepts and techniques to all breast specialists by internationally recognized authors. This is not directed to one single specialty, but across specialty lines, covering a broad range of topics related to breast cancer treatment. It is necessary to recognize the positive impact of body integrity on the quality of life of breast cancer patients, who are living more, but sometimes, unfortunately, not better. So, all efforts should be done in order that all these advances in breast surgery reach most patients around the world.

With the significant improvement in survival, the medical community became more cognizant of the quality of life after breast cancer. Patients' satisfaction and assessment of their quality of life seem to directly correlate with their final appearance after breast cancer surgery, hence the growing interest and enthusiasm among surgeons in the field of oncoplastics and breast reconstruction. The debate about which specialty is entitled to perform this kind of procedure, or, if it is better to have a single or a double-team approach, is obsolete. Since both oncoplastics and breast reconstruction are methods, not specialties, we ought to focus on training to render these techniques available to all breast cancer patients. The real challenge to be faced is not “who” should or can do it, but on “how” best to do it. How to train surgeons, how to replicate it, and how to expand it? Training facilities and skills are worldwide the subject of debate, but the goals are the same.

Plastic surgery creativity and expertise, associated with surgical oncology principles, are the inspiration and mentors for the future of breast surgery. It should be a strong alliance. Effective surgical management of breast cancer requires a complete and deep understanding of both fields, since the patient is unique, and both long-term and disease-free survival should be accompanied with a good quality of life.

South America, Europe, and the United States were together here. Many of the pioneers and leaders in this field are sharing their experiences in this unique book. *Oncoplastic and Reconstructive Breast Surgery Second Edition* was updated and extended with more chapters, authors, and videos. We deeply acknowledge all the contributors for their superb chapters and our families for their love and support.

Curitiba, Brazil  
New York, NY  
Milan, Italy  
New York, NY

Cicero Urban  
Mahmoud El-Tamer  
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Virgilio S. Sacchini

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**Electronic Supplementary Material:** Electronic supplementary material is available in the online version of the related chapter on Springer Link: <http://link.springer.com/>

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**Part I**

**Basic Principles for Oncoplastic  
and Reconstructive Breast Surgery**



# Oncoplastic Surgery: The Renaissance for Breast Surgery

1

Gail S. Lebovic

## 1.1 Background

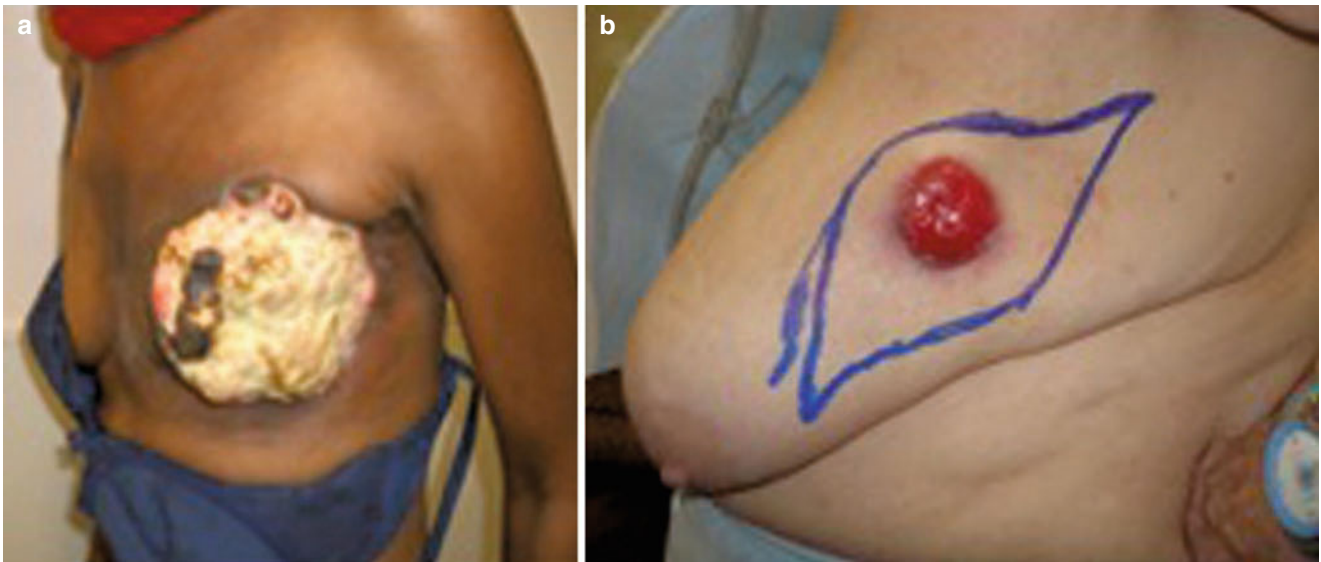
Since the beginning of recorded time, the breast has been a symbol of motherhood, femininity, and sexuality. It has been portrayed throughout history in works of art symbolizing each of these aspects of a woman's life—and even in religious works of art, the breast has been memorialized as a central focus of a woman's anatomy. Similarly, there is evidence of the challenges and ravages of breast cancer dating back as far as the seventeenth century B.C. [1]. Many accounts of this dreaded disease are documented throughout history, and in some regards, the psychological fear and trauma associated with breast cancer have not changed much at all through the ages—even though our diagnostic abilities and treatment options have managed to dramatically improve the outcomes of women with breast cancer. One of the most comprehensive examinations of the breast throughout history was written by Dr. Marilyn Yalom. Her work illustrates how and why the breast has become such an important symbol of femininity throughout history and why the breast continues to be so important to women in today's modern societies [2]. Her description of the breast as both “life-giving” and “life-destroying” gives us the essence of why breast surgeons must be trained with a keen sense of blending science and art.

When we examine the disease processes that affect the breast(s), the historical journey becomes complex and is one that is quite triumphant when looking at how far we have come. Early cases of breast cancer reported large fungating tumors that killed women quickly, and the entire experience was no less than horrific. Unfortunately, even though modern methods of detection have improved early diagnosis, physicians still see late-stage tumors such as those described hundreds of years ago (Fig. 1.1a, b).

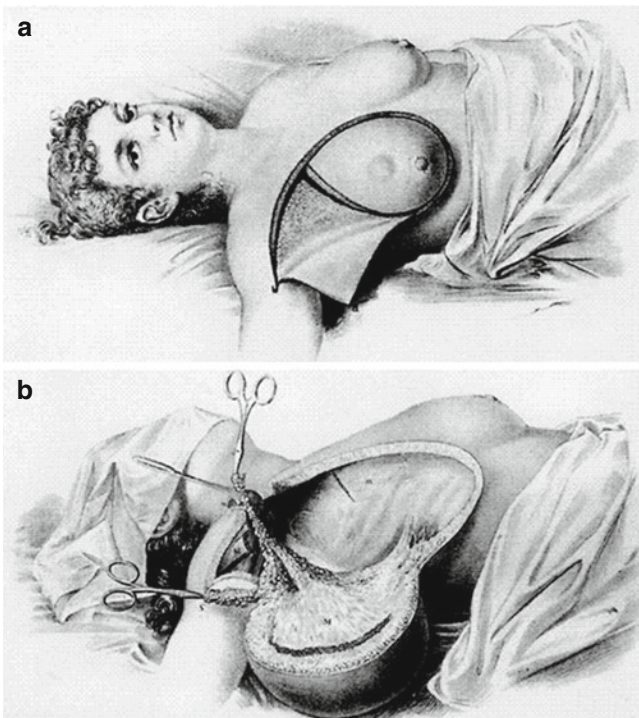
As far as we can tell, although Hippocrates discussed the potential for removal of the breast, the first documented account of mastectomy is credited to Johan Schultes (1595–1645). However, a detailed description of the operation was only published after his death in 1665 [3–5]. Early mastectomies were made possible with the introduction of surgical instruments that allowed for very rapid removal of the diseased tissue. Although the idea of removing the diseased area gained popularity, women often died from bleeding, infection, shock, or anesthetic complications. However, once anesthetic techniques were perfected, and antibiotics became a routine part of surgical regimens, success with removal of the breast was accomplished. As surgeons go, Halsted is most often credited as the innovative surgeon that perfected the technique of radical mastectomy in the United States in 1882. In fact, Halsted achieved a 5-year cure rate of 40% which was highly regarded. In addition to his aggressive removal of tissue, other factors likely contributed to this success rate as well, such as his use of antiseptic techniques and his use of rubber gloves. Apparently, Halsted had asked Goodyear to develop gloves in 1889. Other surgeons such as Crile and Haagensen were also important in the consistent move toward innovation in fighting breast cancer through surgery, and the Halsted radical mastectomy was the mainstay of breast cancer treatment throughout most of the last century. In fact, it was used in over 90% of all breast cancer cases treated between 1910 and 1964 [6].

As we examine the results of the Halsted radical mastectomy (i.e., removal of the entire breast including much of the skin along with the nipple-areolar complex, underlying pectoralis muscles and the axillary contents), we quickly begin to understand the physical and psychological challenges that women face(d) when deciding to undergo this presumed “life-saving” surgery (Fig. 1.2a, b). Although hundreds of thousands of women have lived through this life-altering surgery, it is clear that the psychological impact on women undergoing mastectomy is profound and includes body image changes as well as many other emotional challenges

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**Fig. 1.1** Advanced breast cancer showing fungating lesions extruding through the skin



**Fig. 1.2** Etchings of Halsted radical mastectomy showing enormous en bloc resection of the breast, underlying muscles, and overlying skin

that must be addressed in order for successful adaptation to a “new way” of life. Table 1.1 illustrates some of the critical issues that most women struggle with after receiving a diagnosis of breast cancer. Each and every woman will weigh in differently on the priority of these things in their own particular life, but for most women, the single greatest challenge is the adjustment to their new body image.

**Table 1.1** Emotional issues and breast cancer

- |                               |
|-------------------------------|
| • Fear, anxiety, and distress |
| • Depression                  |
| • Grief                       |
| • Body image                  |
| • Sexuality                   |
| • Fertility                   |
| • Planning for the future     |
| • Social support system       |



**Fig. 1.3** Patient following standard radical mastectomy. Note the body posture with the right shoulder slightly forward as if “guarding” or “hiding” the mastectomy site

The photo in Fig. 1.3 shows a woman many years after radical mastectomy of the right breast. In this photo her body language speaks to us, as it shows her stance with her right shoulder angled upward and forward in a manner

**Table 1.2** Emotional pros and cons of breast reconstruction

Pros	Cons
Feel whole again	Fear
Maintain femininity	Not essential for well-being
Balanced physically	Too old to matter (i.e., being vain)
Marital/sexual acceptance	Interfere with treatment
Avoid embarrassment of prosthesis	Concern about masking disease
Surgeon's recommendation	Uncertainty about breast appearance
Forget about disease	Requires additional surgery, risk of complications

suggestive of protecting, guarding, and/or trying to “hide” the area of her mastectomy. Many studies confirm that breast reconstruction assists women in their adjustment to mastectomy; however, it does not eliminate the need for psychological adjustment, and in fact, consideration to undergo breast reconstruction brings with it additional and somewhat different issues for a woman to grapple with (Table 1.2). It is essential for the breast surgeon to be trained—not only in the technical aspects of dealing with breast cancer—but with the skills to assist women struggling with these difficult and often very delicate psychological challenges as well.

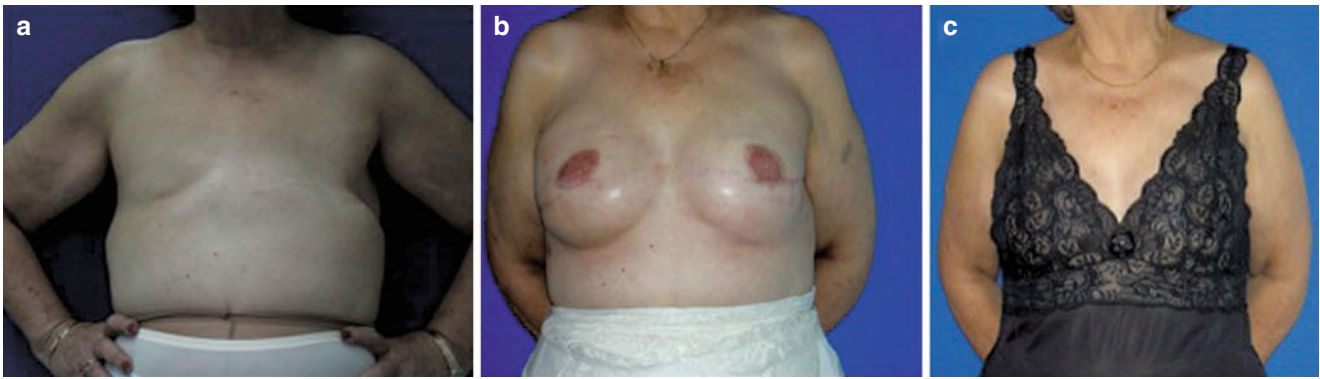
## 1.2 Breast Surgery: Evolution of the Science

With women's advocacy groups forming throughout the 1960s–1970s, social awareness about breast issues and breast cancer began to change dramatically. Just a few decades ago, women were loathed to speak about breast cancer in social circles, whereas today, women take to the streets, gather by the thousands, and celebrate their successes in conquering their battle with breast cancer. This awakening coupled with the “feminist movement” of the 1970s created an environment for women to begin questioning their “rights” in the treatment of breast cancer. At the time, most women underwent open surgical biopsy with preoperative consent for the surgeon to proceed with mastectomy if the frozen section was positive for cancer. One can only imagine how traumatic it was for women who faced the uncertainty of waking up from surgery with or without their breast(s). This practice soon came under scrutiny and ultimately called for the standard of care to include a preoperative confirmation of the diagnosis of cancer prior to mastectomy, as well as informed patient consent prior to surgery. There is no doubt that the work of well-known patient advocate Rose Kushner irreversibly changed history in regard to breast cancer treatment. She was the first breast cancer survivor to bring these issues to Washington and create legislation that helped fuel many changes in the United States. Her efforts were of paramount importance.

Although surgical removal of the breast was touted as a giant step forward in the treatment of breast cancer, no doubt surgeons and their patients both struggle(d) to accept this method as the “best” possible solution. For decades, a growing consciousness began to form about the possibility of imaging the breast in order to find tumors at an earlier stage. Thankfully, through the development of imaging techniques that ultimately led to screening mammography programs, the diagnosis of smaller and often “earlier” cancers was made possible. Thus, with the advent of modern-day breast imaging and the diagnosis of earlier and often noninvasive tumors, improved survival rates and better treatment options became a reality [7–9]. For the breast surgeon, this included the notion that perhaps surgical treatment need not be so aggressive. In addition, the interaction between physicians in different sub-specialties became popular as it was noted that a more comprehensive plan could be developed if and/or when a patients' treating physicians communicated directly with one another in the best interest of the patient.

As radiologists began to diagnose smaller tumors, surgeons began to modify the techniques of Halsted, and they began saving the pectoralis muscles and more of the overlying skin of the chest. Studies quickly noted that survival rates were equivalent to radical mastectomy, and thus the “modified” radical mastectomy became popularized. This huge change in breast surgery was most likely due to the earlier stage of disease at the time of diagnosis, but nonetheless, this changed breast surgery forever. As can be seen in Fig. 1.4, the standard modified radical mastectomy has a typical horizontal scar across the breast area and in most cases does not require a skin graft for closure which was quite commonly needed with the radical mastectomy.

From here, surgeons began to hypothesize that perhaps the breast tissue itself (including the nipple-areolar complex) could be preserved if additional therapy (such as radiotherapy and/or chemotherapy) were administered to help decrease or eliminate potential for recurrent disease. Of course the scientific community required classic studies to be performed in order to prove this hypothesis, and through decades of tedious clinical trials, Dr. Umberto Veronesi and his clinical group at the Milan Cancer Center ultimately proved this to be the case. Veronesi's pioneering work and numerous other scientific studies by various surgeons around the world have shown that survival rates for women undergoing breast conservation are equivalent to those having mastectomy if, and only if, many factors are also taken into consideration such as appropriate selection of patients, wide excision of tumor with substantial clear histologic margins, and the use of adjuvant therapy (chemotherapy and/or radiation therapy) as needed [10, 11]. Ultimately, with these critical decisions being made in the field of breast surgery and through the extraordinary courage and foresight of innovative surgeons, scientists, oncologists, radiation oncologists,



**Fig. 1.4** The *left image* (1.4a) shows the patient 30 years after bilateral modified radical mastectomies. She requested and underwent bilateral breast reconstructions (1.4b) which shows how the horizontal incisions result in a somewhat globular shape of the reconstructed breasts leaving them flattened at the central nipple-areolar area. Normally, this is the area of the breast with the most projection, but this limitation of the

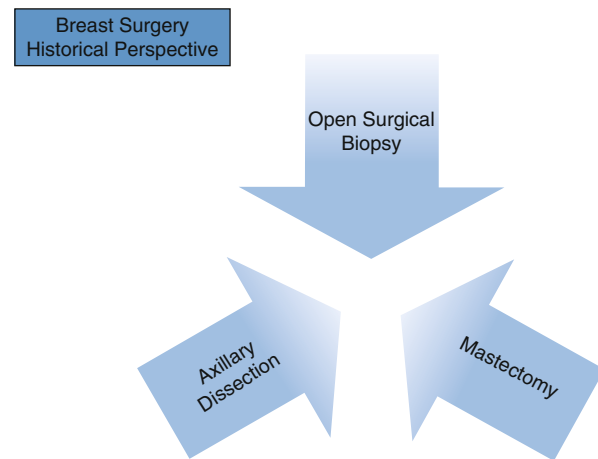
horizontal incision is quite significant and also commonly results in the “dog ear” of excess tissue *left behind* at the lateral aspect of the breast. Even with these limitations, we can see that the breast reconstructions have had a positive impact on this patient’s body image with her regained self-confidence evidenced by her new lingerie (1.4c)

and other breast cancer specialists working together, the field of breast surgery began to evolve dramatically, and it has never been the same since.

While the idea of breast conservation surgery became a reality, and surgeons and patients alike hoped that mastectomy would become a distant historical footnote, studies ultimately showed that not all women were truly good candidates for breast conservation. Interestingly enough, not all women choose breast conservation either, and so the mastectomy has remained a mainstay in the treatment of breast cancer. Two important questions remain, “how can we best identify suitable candidates for breast conservation” and, equally as important, “how can we improve the aesthetic appearance of the breast(s) following mastectomy?” In fact, the selection of appropriate patients for the appropriate procedure becomes the critical question for the breast surgeons’ judgment.

Given today’s current imaging techniques, as well as other sophisticated methods to assist with patient assessment such as genetic testing, the selection of appropriate patients has become much more comprehensive and precise. Today, preoperative assessment is the cornerstone of effective, efficient, and appropriate breast surgery, and it is a vital expertise that the breast surgeon must be able to offer in order to provide optimal care to patients.

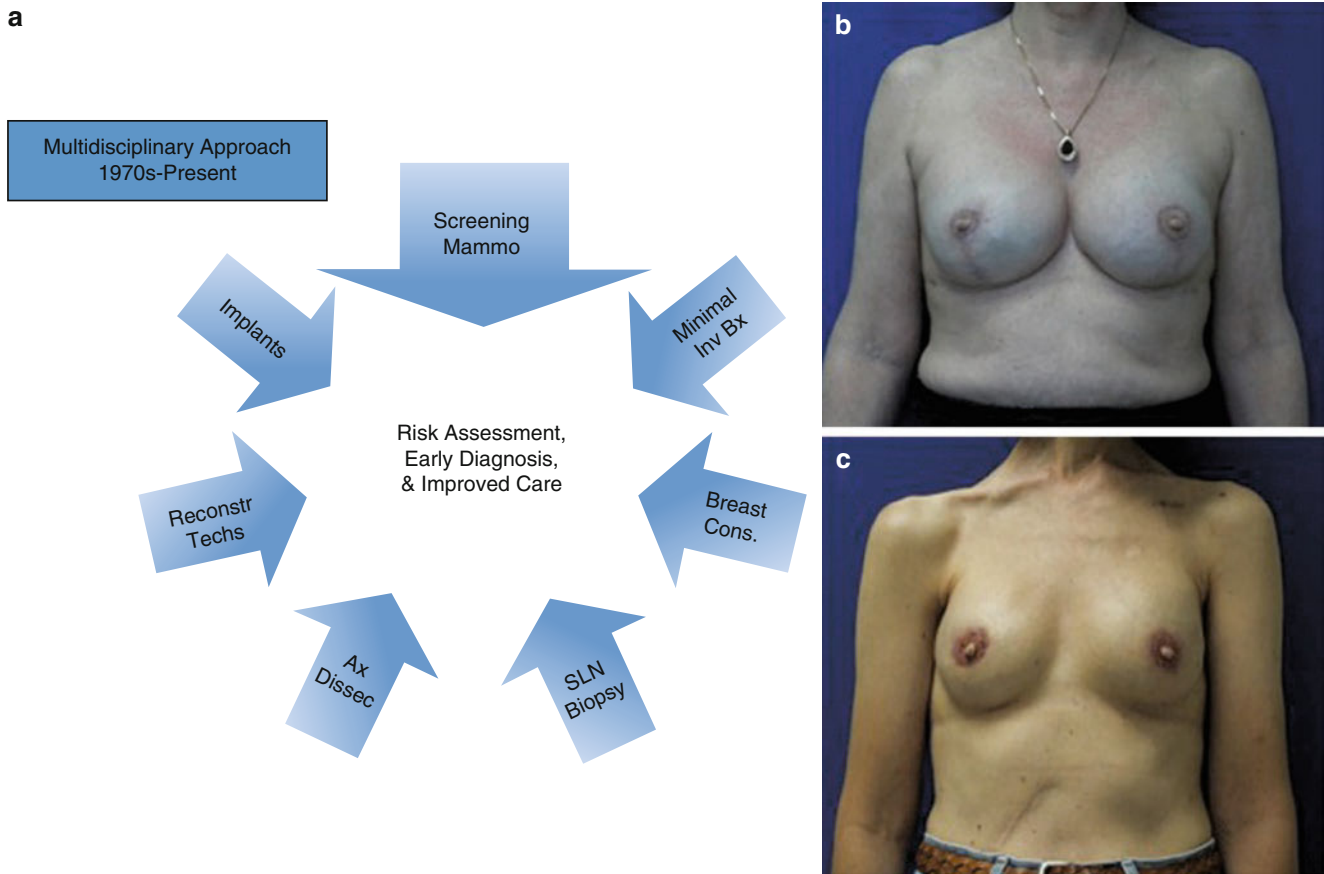
Simultaneous to the changes occurring in the evolution of the “science” of breast cancer surgery, changes in the evolution of the “art” of breast surgery were occurring as well. These changes resulted in dramatic achievements in the field of plastic and reconstructive surgery, and breast reconstruction became the pinnacle achievement for many surgeons.



**Fig. 1.5** Historical perspective of breast surgery with a few of the procedures available throughout much of the last century

Prior to the parallel changes occurring in each subspecialty involved in the care of the breast cancer patient, the surgeon had few choices in the decision-making process. The treatment of breast cancer was obvious and monotonous—mastectomy (radical or modified radical) (Fig. 1.5). However, as diagnostic techniques improved and as treatment options became more complex, the evolution of the multidisciplinary approach to the breast cancer patient became widely popularized, and today, the multidisciplinary approach is recognized as a much more efficient and effective method for treating patients. Today, this approach serves as the ideal model for treatment of breast cancer as well as many other diseases, and this approach allows us to achieve much better surgical outcomes (Fig. 1.6a–c).





**Fig. 1.6** (a) Multidisciplinary approach showing many aspects to patient evaluation and work-up that can be used to assist with preoperative planning and surgical decision-making. *Mammo* mammography, *Inv Bx* invasive biopsy, *Cons.* conservation, *SLN* sentinel lymph node, *Ax Dissec* axillary dissection, *Reconstr Techs* reconstruction techniques. (b) Case example using a multidisciplinary approach and oncoplastic surgical techniques. The patient presented with BRCA mutation, following bilateral prophylactic mastectomies with bilateral breast and nipple reconstructions. The final result shows skin-sparing mastecto-

mies, tissue expansion with ultimate bilateral submuscular saline implants, and nipple reconstructions. (c) Case example using a multidisciplinary approach and oncoplastic surgical techniques. The patient presented with bilateral ductal carcinoma in situ. Mastectomies with bilateral breast and nipple reconstructions were performed. The final result shows total skin-sparing mastectomies, with ultimate bilateral submuscular saline implants (no expansion needed) and nipple reconstructions

### 1.3 Breast Surgery: Evolution of the Art

In parallel, to the changes occurring in the diagnosis of breast disease and the improvements in the treatment of breast cancer, the focus on the female breast became much more socially acceptable. With the introduction of television, magazines, pornography, and more sexually directed marketing, the world's view of a woman's breast began to change since breasts were literally much more visible each and every day. Historically, being "well endowed" has long been a "virtue" that artists and writers have documented throughout the ages.

In the seventeenth century, Marinello became very interested in methods for preserving the beauty of the breast and his account of the perfect breast: "The breast of a beautiful woman should be wide and full of meat so that no sign of

underlying bone be detected and the skin colour should be 'snow-white'. The beautiful neck is like snow but the breast is like milk ... the best breasts are small ones, round, firm, like the round and beautiful apple; they should neither be too attached nor too small ... two raw apples looking like ivory." His description gives us a clear idea of how dedicated he was to developing the art of surgical methods to restore the breasts' own natural beauty [3]. Many others were equally as interested in the "art" of breast surgery, and thus this field began to blossom and take shape.

Some of the earliest methods for breast enhancement relied simply on garments such as corsets and brassieres. These external means of enhancing the breasts, such as padded bras, remain popular today and are well evidenced by the multibillion-dollar lingerie industry. However, surgical enhancement and correction of breast "deformities"

has been an alluring challenge to surgeons since the late 1800s. By the twentieth century, many surgeons were developing and refining various surgical techniques for improving the size, shape, and general appearance of the breasts.

While correction of large and ptotic breasts seemed important and interesting to women and the surgical community, many women were even more interested in methods for enlarging the breasts, and some of the earliest methods for breast enhancement utilized injectables such as paraffin wax and other substances. Unfortunately, most of these methods proved disastrous. In fact one of the first to inject paraffin into the breast for enlargement was Robert Gersuny, and he was also the first to describe paraffinomas in 1899. Later, Buck and Brockaert also described the poor results with this technique, and in fact the results were so bad that decades passed before other invasive techniques were even considered for breast enhancement.

However, as we all know, “necessity is the mother of invention,” and in 1950 J.H. Grindlay and his colleagues implanted polyurethane sponges in an attempt to achieve permanent breast enlargement. While this technique was considered quite innovative, it too proved to be disastrous with the end result yielding severely fibrotic, hardened (calcified) breasts that were usually misshapen and very unattractive in appearance.

Later, substances like silicone oil and gel were introduced into the breast(s) via injection. Scientists and surgeons originally believed that these materials were biologically inert. However, injection of these materials into the breasts often results in a substantial inflammatory response, infections, etc. and ultimately led to the abandonment of these techniques. Instead, the innovative idea of encapsulating these materials within a silicone rubber shell and placing these gel implants into the breast took hold, and the first implantable breast-enhancing “implant” devices were developed [3]. The ability to create a rubber silicone shell filled with physiologic saline created a lot of excitement as well, but the first saline-filled implants were fraught with problems including frequent rupture and severe rippling. Since virtually all of the first breast enhancements (augmentations) were performed in the subglandular position, the results were less than optimal aesthetically. These initial saline implants were also prone to rupture because the shell was too thin and fold-fault fracture causing leaks and deflation were very common which led to the demise of the early saline-filled implants. The next monumental phase in the development of breast implants was continued refinement in the production of various silicone materials and implants. These gels have various degrees of viscosity, making multiple different types of implants possible, including shaped implants for special situations. At last, the era of breast augmentation was on its way to success.

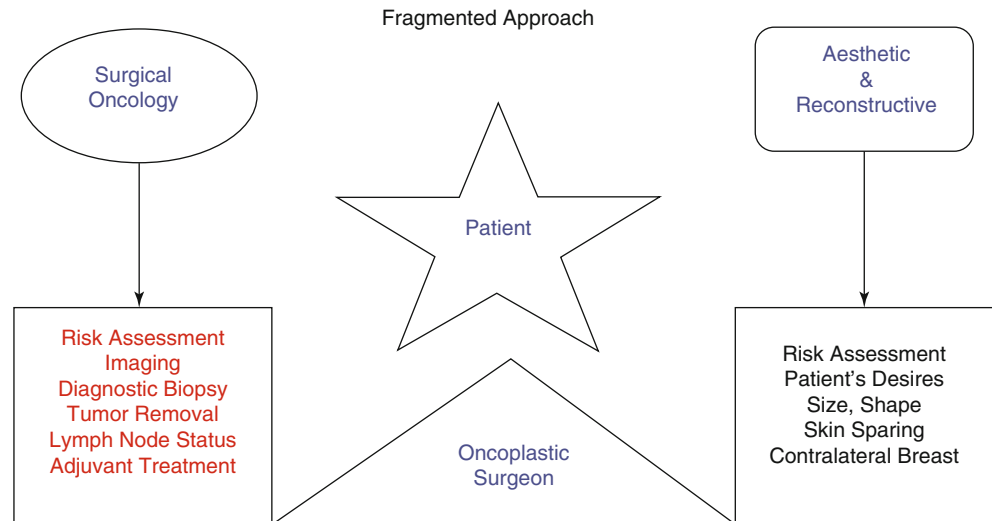
Numerous different types of breast implants were produced and marketed through the 1970s and 1980s, some with better rates of surgical success than others. It didn’t take long for surgeons to figure out that the utility of breast implants could be expanded to the realm of breast reconstruction. However, the paucity of the skin left after mastectomy created some difficulty in regard to closing the skin wound over an implant. Once again the entrepreneurial spirit led to the development of the “tissue expander,” and this wonderful new implant allowed surgeons to begin the era of “immediate” breast reconstruction. Often these expanders can be left in place as the permanent implant. Most importantly, breast reconstruction with tissue expanders is much less invasive and difficult for patients than other types of reconstruction such as myocutaneous flaps. Thus, the patient has less pain, less recovery time, and less time away from work. Expanders are widely used throughout the world, and they remain the “workhorse” for breast reconstruction since they can be used for immediate and/or delayed reconstruction and can maximize the efficiency of breast reconstruction [12].

Breast reconstruction following mastectomy became hugely successful and popular in the 1980s until suddenly in 1990 when implants were banned from clinical use in the United States by the FDA. This sparked a global examination of silicone gel implants in an attempt to examine various problems that some felt might be associated with breast implants. Ultimately, after extensive review and with additional changes and new developments in the manufacturing process, silicone gel implants were reintroduced into the surgical domain. Currently, they are widely used throughout the world and allowed limited use once again in the United States under guidelines outlined by the FDA [13].

Many scientists agree that in fact, it is not the implants themselves that are responsible for some of the difficulties encountered following breast augmentation and/or reconstruction. There are numerous factors that contribute to outcomes following aesthetic and reconstructive breast surgery including patient selection, surgical technique, and postoperative complications such as seroma, hematoma, or subclinical infection. While selection of a specific implant is important, other factors such as surgical approach (submuscular versus subglandular) and surgical technique are also critical in achieving optimal outcomes.

In reviewing the enormous changes that have occurred in breast surgery during the past 40 years, it is quite interesting to note the parallel changes that occurred in breast cancer surgery as well as cosmetic and reconstructive breast surgery. Interestingly, while the process of breast augmentation may seem very different from breast reconstruction, most of the critical issues needed to obtain excellent outcomes are shared in common between the two. This includes many of the psychological and preoperative patient assessment issues as well. Consider first those patients undergoing

**Fig. 1.7** Most commonly, the approach to the breast surgery patient is fragmented. This usually requires two surgeons with distinctly different goals and concerns



augmentation or other elective breast surgery. These women should undergo a thorough multidisciplinary preoperative work-up quite similar to those that all breast cancer patients endure. Although in one group of these patients cancer has already been diagnosed, women undergoing elective breast surgery should be screened for potential breast cancer risk since later in life they will face the need for screening mammography, etc. [14]. This consideration is critical to the patient when choosing various aspects of the augmentation such as implant type, placement, etc. Thus, we see how quickly the lines begin to blur between surgical oncology and aesthetic breast surgery.

It is precisely for these types of observations that in the late 1980s and early 1990s, a few surgeons scattered around the world began to have similar thoughts about the approach to breast surgery. Independently, each of them began to blend the principles of surgical oncology with those of aesthetic and reconstructive surgery resulting in the birth of oncoplastic surgery. At least a decade later, surgeons began to sub-specialize in breast surgery; however the evolution of the training programs for this sub-specialty has varied widely in various environments and is in critical need of updating and expanding the curriculum and standardization.

#### 1.4 Oncoplastic Surgery: Blending Science and Art

Part of the difficulty for today's breast surgeons stems from the historical development of surgical sub-specialties and breast surgery in particular. Because most breast cancer surgery was performed (and often still is) by general surgeons, and because reconstructive surgery remained in the solitary domain of the plastic and reconstructive surgeons, the care of breast patients has been quite fragmented in its approach; see

Fig. 1.7. Historically the general/breast surgeon was primarily concerned with issues relating to cancer. Their focus was primarily on the oncologic portion of the surgical intervention, and their surgical plan remained separate from the patients' needs, wants, and desires in regard to reconstructive and/or breast surgery to create symmetry between the two breasts. Since breast cancer surgery inherently creates a "net asymmetry" between the two breasts, the surgeon cannot ignore the impact this has on the patients' psychological well-being and feeling of "wholeness" since most women are seeking symmetry as the ultimate outcome.

As described in the sections above, the way that breast surgery evolved resulted in a fragmented approach and often did not result in the best outcomes for the patient. Thus, those surgeons committed to sub-specializing in breast surgery began to practice "oncoplastic surgery" by combining or blending the principles of surgical oncology with those of plastic and reconstructive surgery. As illustrated in Fig. 1.8, the objective is to change the fragmented surgical approach to one that is more complete utilizing a multidisciplinary approach to the patient and planning the patients' surgery in a comprehensive fashion. The ideal situation would be to have each and every "breast surgeon" trained as an "oncoplastic surgeon"—that is to say that the terms would be synonymous. This would allow the breast surgeon to take care of the patients' needs, wants, and desires. There are numerous advantages to this approach for the patient and for the surgeon as well. While this may be possible for the future, unfortunately, due to the way that breast surgery evolved, at this point, relatively few breast surgeons are trained and competent in all of the skills required to practice in this manner.

The term "oncoplastic surgery" was first coined by Dr. Werner Audretsch and was meant to describe this integrated "holistic" approach to the breast cancer patient. In