Immediate Breast Reconstruction (Direct to Implant)

34

Mario Rietjens, Pietro Loschi,
and Leonardo Pires Novais Dias

34.1 Introduction

The treatment of breast cancer until the late nineteenth and beginning of twentieth century was highly mutilating for the patients, in order to have some possibility of cure [1]. The standard surgery, at that time, removed large amounts of skin and thoracic muscles [2], combined aggressive radiotherapy, and determined a significant tissue degradation. With all these sequelae due to the treatment, it was practically impossible to propose any type of technique for breast reconstruction. The evolution of our biological knowledge of the breast cancer [3, 4], in association with screening programs all around the world, provided an initial phase diagnosis [5–10] and consequently concedes a de-escalation of the mutilating treatment [11–21]. These factors contributed to preserve the patient's quality of life [22–24].

The development of a non-mutilating mastectomy, as skin-sparing mastectomy or nipple-sparing mastectomy, was the main factor to evolve indications of direct-to-implant reconstructions (DTIRs) [14, 15, 17, 18, 20, 21, 25–44]. The conservative mastectomy represents the main step on surgical technique by preserving more overall skin and surface area to place an implant and by helping to avoid some of the flattening associated with closure of skin-sparing incisions [30, 40, 41].

The implantable devices evolution was also very crucial to increase indications to DTIR. The first breast silicone implant was used in 1960, and since then, the medical industry invested massively on research and innovations, and the surgeon today has an arsenal of possibilities to use, especially prosthesis and meshes. There were improvements on several points: less capsule contracture, more resistant and durable materials, and better cosmetic results concerning the anatomical implants with different models, shapes, and dimensions [1, 28, 39–41, 44–62].

The aim of this chapter is to give an overview about patients and implant selections in cases of DTIR, focusing in surgical planning, technical aspects, and complication management.

34.1.1 Indications

The technique indications are related to two main variables: breast anatomy (volume and shape) and tumor characteristics (size, local extension, and muscles or skin infiltration) [17, 19, 63–68]. Following the patient individuality, different patterns of mastectomy can be applied.

34.1.1.1 Small or Medium Breasts

Nipple-sparing mastectomy: in cases of breast with minimal ptosis, small peripherally located tumors with nipple-areola complex distance >2 cm, and negative subareolar duct margins. In selected cases, larger tumors can be submitted. Contraindicated in patients with inflammatory breast cancer, clinical involvement of the nipple-areola complex, nipple retraction, Paget disease, bloody nipple discharge, or multicentricity (Fig. 34.1).

Skin-sparing mastectomy: in cases of tumors closer to the nipple-areola complex, positive subareolar duct margins and previous scars that compromise the nipple-areola complex blood supply. On this last situation, the nipple-areola complex graft can be performed after the intraoperative subareolar duct evaluation. Contraindicated in patients with inflammatory breast cancer and extensive skin involvement by tumor (Fig. 34.2).

34.1.1.2 Large Breast

Conventional total mastectomy: in cases of large breast with ptosis grade III or IV and large tumors near the skin. It is possible to remove a large amount of skin over the tumor and have enough skin to perform a DTIR (Fig. 34.3).

M. Rietjens (✉) • P. Loschi • L.P.N. Dias
Plastic and Reconstructive Surgery Department, European Institute of Oncology—IEO, Via Ripamonti, 435, Milan 20141, Italy
e-mail: mario.rietjens@ieo.it; pietro.loschi@ieo.it; lpndias@hotmail.com

U. Veronesi et al. (eds.), *Breast Cancer*, DOI 10.1007/978-3-319-48848-6_34

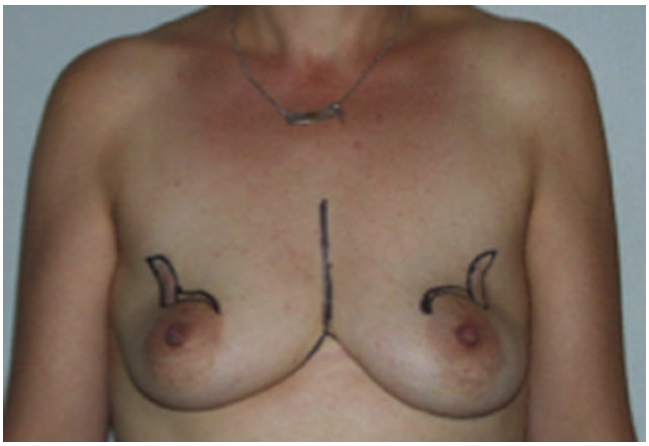

Fig. 34.1 Preoperative drawings for nipple-sparing mastectomy removing the previous biopsy scars

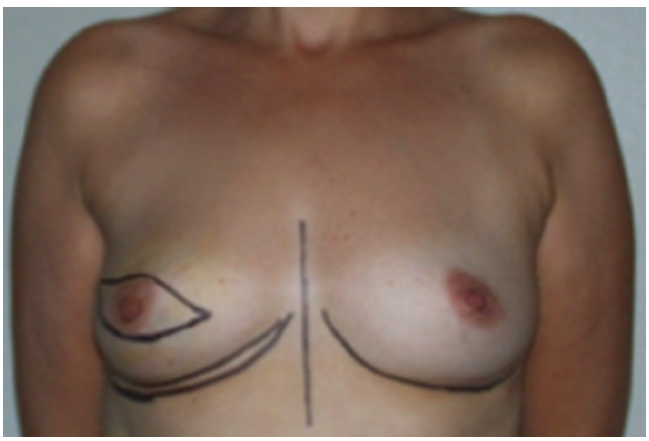

Fig. 34.2 Preoperative drawings for skin-sparing mastectomy removing small amount of skin

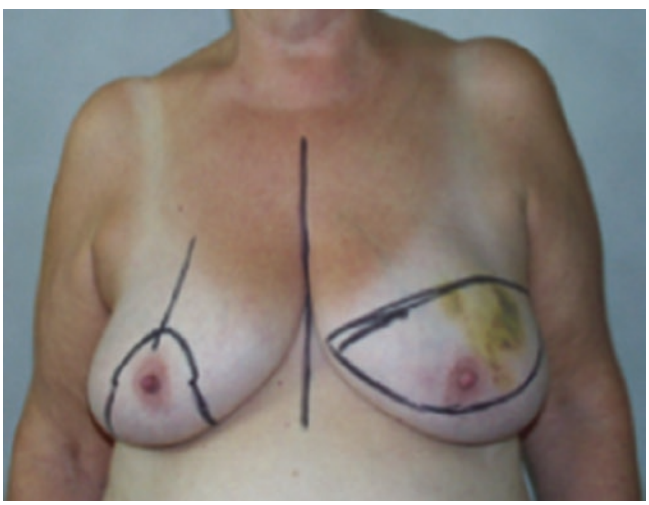

Fig. 34.3 Preoperative drawings for total mastectomy removing large amount of skin over the tumor located in the upper outer quadrant

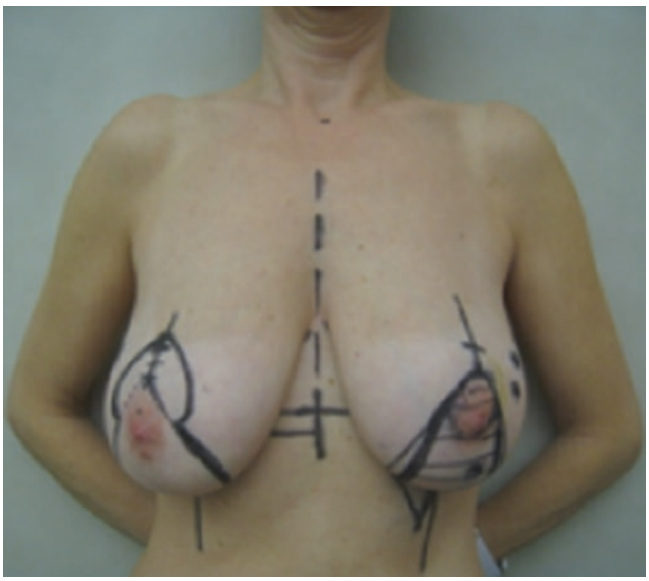

Fig. 34.4 Preoperative drawings for a left skin-reducing mastectomy with a modified "Wise pattern"

Wise pattern mastectomy: in cases of large breast with ptosis grade up to II (moderate). It is possible to remove an amount of skin in order to have an adequate skin envelope to cover the implant. Contraindicated in patients with inflammatory breast cancer and extensive skin involvement by tumor (Fig. 34.4).

Skin-reducing mastectomy: in cases of large breast with ptosis grade III or IV (advanced or severe, respectively). It is possible to reduce the amount of the skin envelope with a lower pole skin deepithelialization and use the dermis to help the implant cover. Contraindicated in patients with inflammatory breast cancer and extensive skin involvement by tumor (Fig. 34.4).

34.1.1.3 Relative Contraindications

Advanced disease (stage III or higher)
Need for postmastectomy radiotherapy
Significant medical comorbidities such as active smoking, obesity, or cardiopulmonary disease

34.1.2 Planning

Optimal management requires a multidisciplinary approach between oncologic and reconstructive surgeons, radiologists, pathologists, medical oncologists, nurses, and physiotherapists. This allows providers to coordinate cancer and reconstructive procedures with postoperative recovery and adjuvant treatment. Also, the oncological multimodality access has been associated with a reduction in breast cancer

mortality [69]. A caring relationship is crucial to patient satisfaction with the reconstructive process and must be established early [70]. Therefore, it is important to embrace the patient with all endearment since the first interview. In-hospital is highly recommended to examine the patient the day before the operation and explain again the complete surgical procedure in order to have the patient's consensus.

34.1.2.1 Preoperative Evaluation

History and physical assessment should focus on the following factors: stage disease, oncologic treatment plan, past surgical history, comorbidities, volume and shape of contralateral breast, body habitus, smoking story, and potential donor sites for autologous reconstruction.

A past medical history of radiotherapy on the same site or current disease extent for which radiotherapy is mandatory influences reconstructive options. Radiotherapy leads to fibrosis, which compromises the quality of the skin and underlying tissue, resulting in a higher incidence of complications from the reconstructive procedure, and may produce a less esthetically pleasing result [28–31, 59, 71–80].

Comorbidities such as obesity [31, 53, 59, 76, 81, 82], insulin-dependent diabetes mellitus [53, 76, 82], chronic obstructive pulmonary disease, smoking [31, 53, 59, 76, 81–83], and connective tissue disease may impact also the patient's reconstructive options. When poorly controlled, these comorbidities may increase the risk for complications such as impaired wound healing, reduced tissue perfusion, and infection [76, 84]. In addition, past surgical history of coronary artery bypass grafting (with use of internal mammary vessels) may limit reconstructive choices because of their adverse effects on the breast tissue blood supply.

Tobacco use also poses significant risks [31, 53, 59, 76, 81–83]. Due to the nicotine effect, as well as generalized tissue hypoxia as a result of carbon monoxide, this can increase the risks of tissue necrosis, delayed healing, and infection [85, 86]. For these reasons, avoidance of smoking is recommended for at least 4 weeks prior to surgery and 2 weeks following surgery.

The physical examination of the breasts includes an evaluation for volume, ptosis, asymmetry, scars, and the axilla examined for palpably abnormal lymph nodes. The abdomen and back are evaluated, taking note of scars and patient's personal distribution of excess skin and fat. Technical details such as the type of incisions following the oncological and plastic goals and the need of a contralateral breast correction are also determined at this moment. The patient's wishes regarding scar location, tissue sacrifice, postoperative recovery, and esthetic outcome are also important in guiding the reconstructive surgeon. Finally, the evaluation of bilateral mammograms, bilateral breast and axilla ultrasound, and, in specific cases, breast magnetic resonance is also indispensable.

Photographs of the patient standing and preoperative drawings are performed after admission at the hospital. During the preoperative drawings, it is important to do specific breast measurements as base width and height, projection, and pinch test (to evaluate the skin and subcutaneous thickness). With all these parameters, it is possible to calculate the range of models and implant size to be used.

34.1.2.2 Intraoperative Evaluation

The initial evaluation consists of verifying the skin and muscles integrity, soft tissue blood supply, and inframammary fold preservation. The implant is chosen using preoperative measurements, mastectomy weight, and contralateral breast modifications (reduction or breast augmentation). The use of sterile sizers is helpful to select the best implant aiming good symmetry.

The advent of real-time perfusion mapping and similar technologies represents an important aid for intraoperative planning. Some models predicting the risk for mastectomy flap necrosis have surfaced [87]. Although simple in concept, the surgeon's intraoperative judgment may be one of the more challenging aspects of DTIR and should be a focus of the perioperative decision-making process [29, 31, 88–90]. The unpredictable nature of the defect after oncologic resection is a particularly limiting factor, as implant size depends on the available soft tissue envelope.

In cases of soft tissue commitment and impossibility to perform the programmed surgery, the surgeon can convert it into a two-step reconstruction, using a tissue expander. In these cases, it is not recommended to perform the contralateral breast symmetry. A new evaluation will be done at the end of the expander inflation, and the surgery must be integrated with the timing of oncological treatment.

34.2 Implant Pockets

Until some years ago, I did not recommend the insertion of definitive prosthesis in the same location of the removed breast. The complication rates are very high, and if, unluckily, a small skin necrosi arrives or a scar dehiscence emerges, an exposure of the implant can occur, and the implant removal is necessary. Even if there are no postoperative complications, the normal healing around the implant with the capsule formation gives a very bad cosmetic results, with an aspect of "ball attach to the thorax" with an unpleasant aspect.

Nowadays, different possibilities of implant pockets are available, due to the new materials evolution [43, 91].

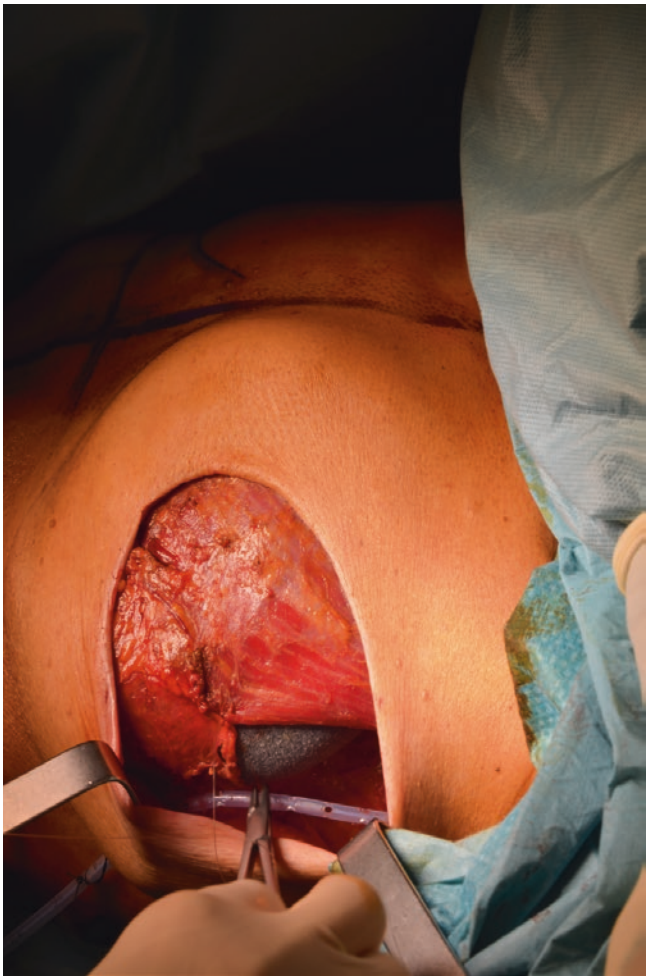

Fig. 34.5 Complete muscular pocket with pectoralis major muscle and serratus muscle

34.2.1 Total Muscular Pocket (Pectoralis Major and Serratus)

It was the first technique used in the past, when the mastectomy was less conservative. With this technique it was possible to cover completely the implant and avoid implant exposition in cases of skin necrosis. The cosmetic results were quite good when using small and round-shaped implants, but in cases of medium or large anatomical implants, it is difficult to cover completely the implant, and the cosmetic results are inferior because the lateral breast shape is compressed by the serratus muscle (Fig. 34.5).

34.2.2 Partial Muscular Pocket (Pectoralis Major)

This technique can be applied with safety in cases with a good lateral skin flap and when is possible to put all the mastectomy scar over the pectoralis major muscle, that one may have a good protection in cases of small skin necrosis or dehiscence. It is a very simple and quick technique and allows good results with anatomical or round implants. If the serratus muscle fascia is preserved during the mastectomy, it is also helpful to use it to cover partially the implant and avoid implant displacement, since it is the path of least resistance (Fig. 34.6).

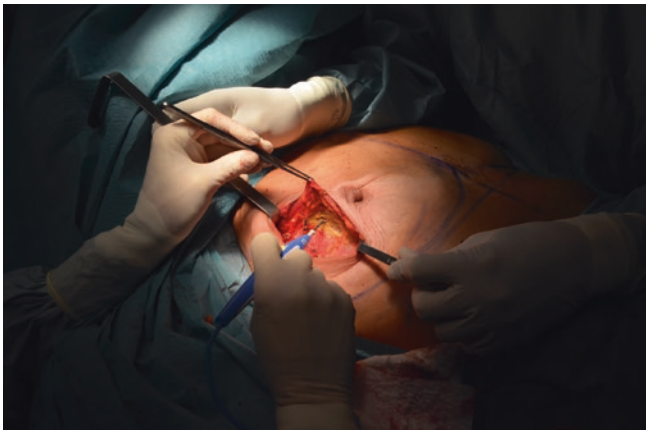

Fig. 34.6 Partial muscular pocket with only the pectoralis major muscle

34.2.3 Pectoralis Major Muscle and Synthetic Meshes

It is normally used in the outer lower portion of the breast, fixed to the lateral margin of the pectoralis major muscle and in the inframammary fold. The main indication of this material is mechanic, to maintain the implant at position and reduce the pectoralis major muscle retraction. The major problem with this material is the increase incidence of postoperative complications. The synthetic mesh is a low-cost alternative to biological matrices [35, 36, 39, 52, 57].

34.2.4 Pectoralis Major Muscle and Biological Meshes

The biological mesh is a collagen tissue matrix from which cell debris, DNA, and RNA are removed by complex proprietary process, leaving behind an acellular matrix [92]. This immunologically inert biological implant serves as scaffold necessary for tissue ingrowth, angiogenesis, and regeneration and can be integrated completely in few weeks. It is normally used in the outer lower portion of the breast, fixed to the lateral margin of the pectoralis major muscle and "wrapped" over the implant, not fixed to the inframammary fold. The major goal is to create a new tissue surface to cover the implant and reinforce the thickness in the outer lower portion of the breast [34, 53, 55, 61, 93, 94]. The material is

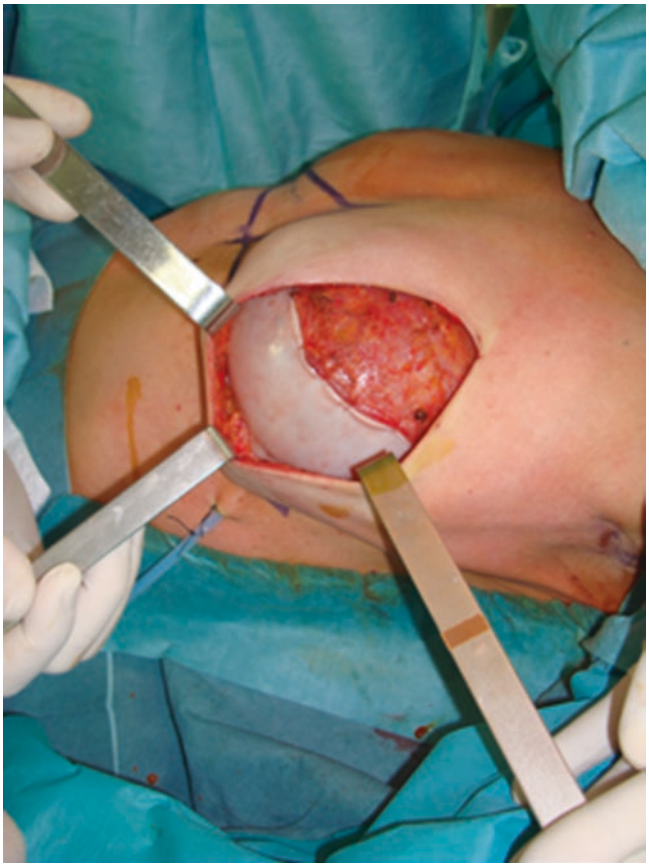

Fig. 34.7 Mixed pocket with pectoralis major muscle and ADM in lower outer quadrant

still very expensive [95, 96], and in our institute, the main indications are in cases with previous radiotherapy or complete inferior detachment of the pectoralis major muscle and rectus abdominis fascia. Using these material in these indications, it is possible to avoid a muscular flap, and it is also possible to reduce the capsule contracture after an implant breast reconstruction in cases with previous radiotherapy [55, 59, 61, 62, 97, 98] (Fig. 34.7).

A recent meta-analysis demonstrated that the risk of implant loss was not significantly affected by whether or not ADM was used. This result may be surprising given that the risk of infection, seroma, and mastectomy flap necrosis were significantly elevated in the ADM cohort. Although the use of ADM raises the risk of other complications including infection, they may not be that serious and can be clinically controlled without causing the implant removal [61].

34.2.5 Only Biological Mesh

Recent developments of this new technique showed that it is possible to do a breast reconstruction with implant without any muscle. The implant is completely covered with the biological mesh and implanted in the subcutaneous space. The cost is still very expensive and remains the main problem with this kind of technique [99, 100] (Fig. 34.8).

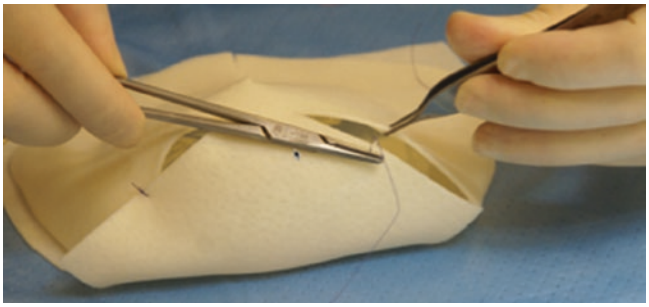

Fig. 34.8 Braxton® device consists in an ADM pocket with the implant inside, and it will be positioned in the subcutaneous space

34.3 Contralateral Breast Management

The goal of DTIR is an immediate reconstruction with definitive implant avoiding a second operation [1, 40]. For this reason, a contralateral breast mastoplasty is necessary in order to get an optimal symmetry [101–104] (Figs. 34.9, 34.10, 34.11, and 34.12). There are four main options for the contralateral breast.

34.3.1 Mastopexy

The DTIR allows a reconstructed breast without ptosis; for this reason, the contralateral ptosis should be corrected in order to get a good symmetry. Several techniques are available depending on the ptosis degree.

34.3.2 Reduction Mammoplasty

The DTIR is limited for the size of the breast to be reconstructed, because the maximum breast implant size available is around 700 cc. For this reason, in cases of large contralateral breast, a reduction mammaplasty should be performed in order to get a good symmetry. Several techniques are available depending on the breast shape, dimension, and ptotic degree.

34.3.3 Breast Augmentation

This technique is proposed for patients with small breasts and desiring a breast augmentation. The implant used is

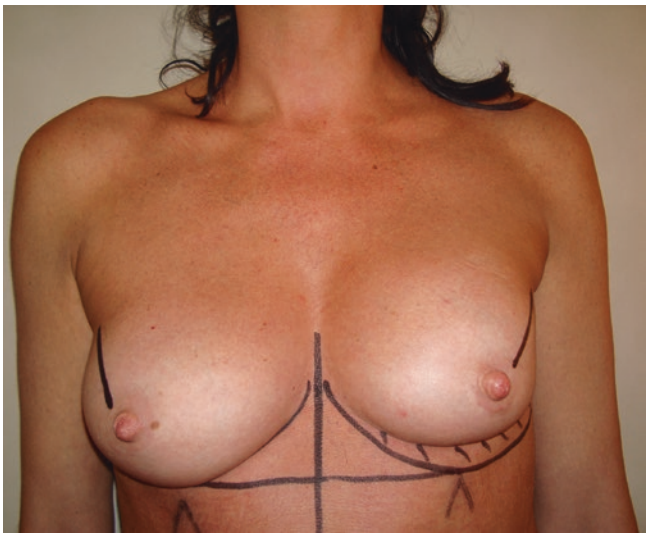

Fig. 34.9 Preoperative drawings for a bilateral nipple-sparing mastectomy with a radial incision and a DTIR

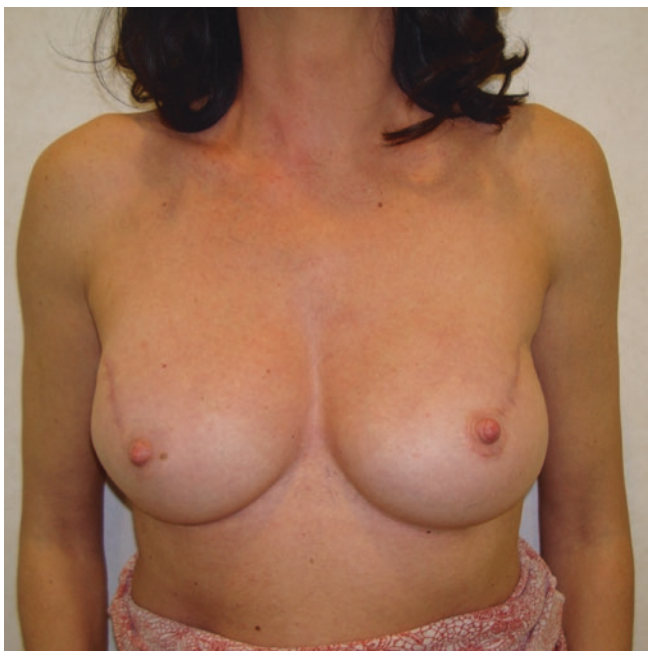

Fig. 34.10 Final results after 6 months

frequently as a round-shaped implant positioned under the glandular tissue or under the pectoralis major muscle (dual plane technique).

34.3.4 Prophylactic Contralateral Mastectomy

This technique increased the indications in the last years after the possibility to diagnose a breast cancer familiarity with BRCA 1 and 2 genetic test [105]. Using the same technique and the same implant size and shape in both breasts, the breast symmetry is frequently optimal [106].

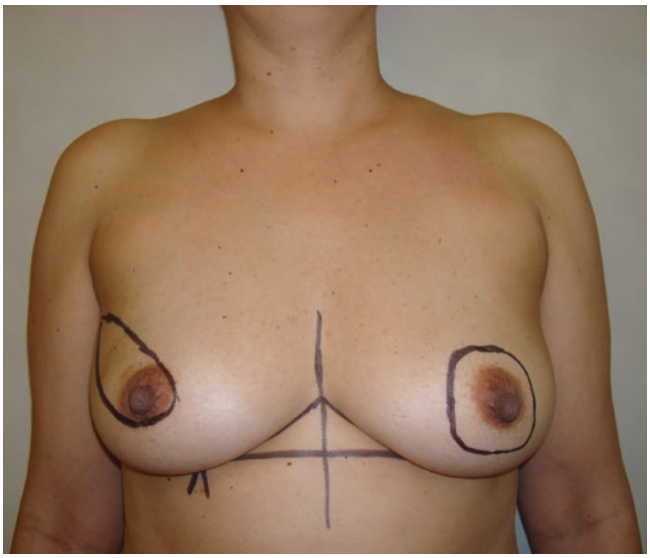

Fig. 34.11 Preoperative drawings for a right total mastectomy and DTIR and left periareolar mastopexy.

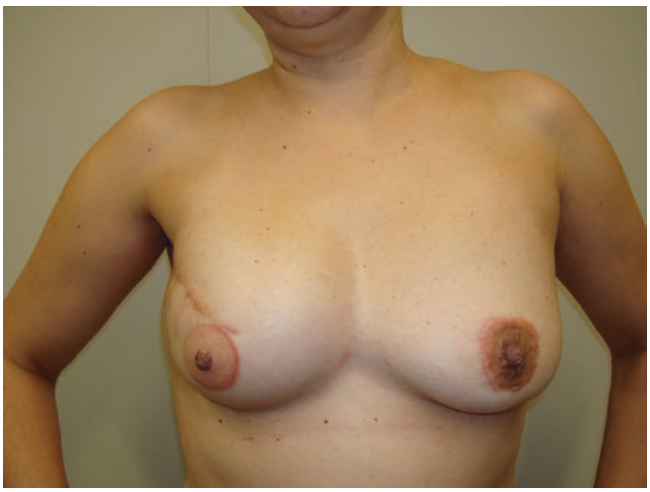

Fig. 34.12 Final results after 12 months.

34.4 Technical Aspects

34.4.1 Cleaning and Arm Reposition

Once the mastectomy is finished, the skin is cleaned once again with chlorhexidine [107], and new sterile drapes are placed on top of the original ones. The arms are positioned along the body on arm boards, in order to promote a pectoralis major relaxation.

34.4.2 Skin and Muscle Evaluation After Mastectomy

The two main points are the coverage capacity, allowing the junction of tissue flaps without excessive tension on the suture, and the vascular supply of the mastectomy flaps that is evaluated by soft tissue thickness, color, and bleeding.

34.4.3 Pocket Dissection

The pectoralis muscle is elevated with a light retractor from lateral to medial; the lower muscle attachment is released with electrocautery from approximately 4–8 o'clock, preserving the rectus abdominis fascia, which is essential to have a complete pocket. The inferior dissection is performed until the inframammary fold level. The lower outer pocket dissection depends on the technical choice; the implant can be positioned subcutaneously, under the serratus fascia or under the serratus muscle.

34.4.4 Cleaning and Draining

The skin is cleaned once again with chlorhexidine, and internal pocket is irrigated with povidone solution [108]. One or two drains are inserted: one drain is in the submuscular pocket and, in cases of axillar lymphadenectomy, a second drain is placed in the subcutaneous space and axilla.

34.4.5 Implant Insertion

The operative team is also structured, so that there are no changes of surgical scrub technicians once the implant is opened until it is inserted in the breast pocket. The gloves are changed; only one surgeon handles the prosthesis and the implant is placed. The pocket is closed using monocryl 3.0 sutures.

34.4.6 Skin Closure and Dressings

The skin edges are trimmed and the skin is closed in layers with monocryl 3.0 and 4.0. Drains must be open at this time, to control the surgical site. Then Steri-Strips are positioned over suture site, and sterile gauze dressing is placed around the drains.

34.4.7 Post-op Cares

The patient stays in the hospital one or two nights. A sportif bra is placed prior to discharge from the hospital, after the prime dressing is pulled off, to help support the implant(s). Upon discharge, the drains, which are covered with and occlusive dressings, are maintained for 7–14 days, with removal determined by the amount and quality of their output, which should be less than 40 cc in 24 h.

34.4.8 Nipple and Areola Reconstruction

In cases of DTIR that the NAC was not preserved, the option of nipple-areolar reconstruction is proposed to the patients after 4 months. There are multiple techniques by which a nipple and areola can be recreated. Surgical methods involve local tissue rearrangement procedures or skin grafts [109]. These techniques are executed on day hospital, considering that it requires only local anesthesia. Once the projecting papilla has been created, the appearance of the entire nipple-areola complex can be enhanced by the use of tattooing. An alternative to surgical reconstruction of a nipple is three-dimensional tattoo. This is usually performed in a nonmedical setting by an experienced tattoo artist. The results have been excellent and patient satisfaction has been high.

34.5 Complication Management

34.5.1 Hematomas

It occurs usually in 1–5% [28, 29, 31, 55, 110] of the patients within 1–3 days after surgery. The symptoms are swelling of the breast and increasing pain that, sometimes, does not respond to pain reliefs. If the amount of blood is small, no treatment is required if the drains are still in place, but if the collection is moderate or large, a surgical revision is necessary to remove the coagulated blood, clean the cavity e insert new drains.

34.5.2 Skin Necrosis

The risk of skin necrosis is higher in DTIR compared with tissue expander reconstruction [37, 110, 111]. It occurs around 1.25–26% [28, 31, 55, 112]. Conservative wound care and a second intention healing can be used if the implant is completely covered by the muscles [82, 112]. In cases of skin necrosis with partial muscular pocket, the risk of implant exposure and an implant removal is very high. In these cases, the skin edge necrosis can often be managed with debridement and closure under local anesthesia. If the necrosis is more severe, the implant may need to be downsized or changed to a tissue expander [76, 83].

34.5.3 Seroma

34.5.3.1 Immediate

In the days following the surgery, fluid can collect around the implant, causing pain or swelling, if it is not adequately drained or if the drains are removed before the body can reabsorb the lymphatic fluid. It occurs in 1.5–7.5% of the cases [29, 31, 55, 56]. Removal of larger seromas is recommended since they can become infected. Usually, the fluid can be removed carefully with a puncture guided by an ultrasound and does not require additional surgery [56, 76].

34.5.3.2 Delayed

The etiology remains unclear; one supposed cause can be due to an internal tissue irritation with the textured implant surface in cases of an intense physical effort. Another possibility is a focal infection outside of the breast (oral, urinary, etc.) that can stimulate a fluid production around the implant. In cases of small seromas, only an oral therapy with antibiotics and anti-inflammatory for 10 days can solve the problem. Otherwise, in cases of large seromas, it is also necessary to aspirate the liquid to do bacterial analyses (antibiogram) and also cytology, for eventual diagnosis of anaplastic large cell lymphoma (ALCL) [113, 114]. In cases of frequent seroma recurrences, it is necessary to do an implant revision with large capsulectomy and implant change.

34.5.4 Infections

In cases of DTIR, it is around 1–5.2% of the cases [28, 29, 55, 115], and the most common organisms are *Staphylococcus aureus* and *Staphylococcus epidermidis* [115–117]. The main symptoms include pain, cellulitis, swelling, and fever. Initially, the treatment is based on oral antibiotics or, if the infection is severe, on intravenous antibiotics until the clinical and laboratory exams maintain stable for 48–72 h; then recommendation is return to oral antibiotics for 1–2 weeks more [76]. In severe cases, antibiogram is strongly suggested to guide the treatment. The presence of gram-negative rods or methicillin-resistant *Staphylococcus aureus* is relative contraindication to salvage attempts based on the poor success rate. The risk factors associated with postoperative infections after IBR are chemotherapy, smoking, radiation therapy, intraoperative lymph node dissection, and larger breast size [116]. In cases of severe infections, without positive response with antibiotics, the implant removal is indicated, clean and drain the breast, and reevaluate the local conditions after 4 months, in order to plan another breast reconstruction [76].

34.5.5 Implant Exposition

The implant exposition can be observed after skin necrosis or wound dehiscence. It occurs around 2% [28]. The decision to try to conserve the implant depends on the time between the exposition and medical evaluation (more time = more possibility of implant contamination) and the skin quality and elasticity or previous radiotherapy. A case with good local conditions and short time of exposition is indicated to make a debridement, new suture under local anesthesia, and antibiotic therapy. In the contrary, in cases with bad local conditions or previous radiotherapy and large time of exposition, the best solution is the implant removal and revaluation after 4 months for a new technique of breast reconstruction.

34.5.6 Implant Rotation

The main problem is due to a poor adhesion between the implant and the capsule, and the reasons can be thin capsula, periprosthetic fluids, or double capsulae. It occurs around 0.9% [55]. An implant surgical revision is indicated with a large capsulectomy to create a new adhesion area; try to close death spaces and also consider to change the anatomical implant with a round-shaped implant.

34.5.7 Capsular Contracture

This is the main long-term problem after implant surgery, and the rates are very different in the literature [28, 29, 55, 56]. The characteristics are pain, hardness, and changes on breast shape. The classification of Baker is useful to guide the treatment on this situation, and usually capsulotomy associated with implant replacement is reserved for Baker III/IV. A number of factors may reduce the occurrence of capsular contracture. These include submuscular implant location, use of textured implants, and prevention of postoperative infection or bleeding. Radiotherapy is closely connected with capsular contracture, because of its effects over the soft tissue [28–31, 53, 56, 71–75, 77–80].

34.5.8 Implant Rupture

The recent implant rupture is not detected by clinical examinations; for this reason, our follow-up protocol for patients with implant is a bilateral breast ultrasound each year and a breast MRI at 10–15 and 20 years of implantation [118–120]. In cases of implant rupture, an implant surgical revision with capsulectomy is indicated; remove the implant and all silicone inside the capsula and change the implant. In cases of axillar lymph nodes augmented after implant rupture, lymph

node removal is indicated only in cases presenting a very large and painful nodes. The others lymph nodes slightly augmented can be followed, and it will become normal few months after the implant change.

Conclusions

There are a number of potential advantages to single-stage DTIR as opposed to a conventional two-stage implant reconstruction. One benefit is avoiding a second operation and the expansion period necessary for tissue expander/implant reconstruction, allowing a shorter time to final reconstruction [28, 30, 37, 40, 110]. It improves patient quality of life and reduces the inconvenience of frequent clinical visits [28, 30, 37, 40, 110, 121]. The direct-to-implant procedure may have a higher risk of postoperative comorbidities and failure compared with two-stage reconstruction, so patient selection is an essential issue combined with a good surgical team experience [28, 29, 37, 40, 41, 55, 58, 60, 76, 81, 110, 122–125].

References

1. Champaneria MC, Wong WW, Hill ME, Gupta SC (2012) The evolution of breast reconstruction: a historical perspective. World J Surg 36(4):730–742. doi:10.1007/s00268-012-1450-2. PMID: 22350474
2. Halsted WS (1894) The results of operations for the cure of cancer of the breast performed at the Johns Hopkins Hospital from June, 1889, to January, 1894. Ann Surg 20(5):497–555. PMID: 17860107
3. Masters GA, Krilov L, Bailey HH, Brose MS, Burstein H, Diller LR, Dizon DS, Fine HA, Kalemkerian GP, Moasser M, Neuss MN, O'Day SJ, Odenike O, Ryan CJ, Schilsky RL, Schwartz GK, Venook AP, Wong SL, Patel JD (2015) Clinical cancer advances 2015: annual report on progress against cancer from the American Society of Clinical Oncology. J Clin Oncol 33(7):786–809. doi:10.1200/JCO.2014.59.9746. Epub 2015 Jan 20. Review. PMID: 25605863
4. Ambrosone CB, Hong CC, Goodwin PJ (2015) Host factors and risk of breast cancer recurrence: genetic, epigenetic and biologic factors and breast cancer outcomes. Adv Exp Med Biol 862: 143–153. doi:10.1007/978-3-319-16366-6_10. Review. PMID: 26059934
5. Andersson I, Andrén L, Hildell J, Linell F, Ljungqvist U, Pettersson H (1979) Breast cancer screening with mammography: a population-based, randomized trial with mammography as the only screening mode. Radiology 132(2):273–276. PMID: 461778
6. Nyström L, Andersson I, Bjurstam N, Frisell J, Nordenskjöld B, Rutqvist LE (2002) Long-term effects of mammography screening: updated overview of the Swedish randomised trials. Lancet 359(9310):909–919. Review. PMID: 11918907
7. Nelson HD, Tyne K, Naik A, Bougatsos C, Chan BK, Humphrey L, U.S. Preventive Services Task Force (2009) Screening for breast cancer: an update for the U.S. Preventive Services Task Force. Ann Intern Med 151(10):727–737 . doi:10.7326/0003-4819-151-10-200911170-00009W237–W242. Review. PMID: 19920273
8. Berg WA (2009) Tailored supplemental screening for breast cancer: what now and what next? AJR Am J Roentgenol 192(2):390–399. doi:10.2214/AJR.08.1706. Review. PMID: 19155400
9. Independent UK Panel on Breast Cancer Screening (2012) The benefits and harms of breast cancer screening: an independent review. Lancet 380(9855):1778–1786. doi:10.1016/S0140-6736(12)61611-0. Epub 2012 Oct 30. Review. PMID: 23117178
10. Lauby-Secretan B, Scoccianti C, Loomis D, Benbrahim-Tallaa L, Bouvard V, Bianchini F, Straif K, International Agency for Research on Cancer Handbook Working Group (2015) Breast-cancer screening—viewpoint of the IARC Working Group. N Engl J Med 372(24):2353–2358. doi:10.1056/NEJMsr1504363. Epub 2015 Jun 3. PMID: 26039523
11. Toth BA, Lappert P (1991) Modified skin incisions for mastectomy: the need for plastic surgical input in preoperative planning. Plast Reconstr Surg 87(6):1048–1053. PMID: 1852020
12. Simmons RM, Fish SK, Gayle L, La Trenta GS, Swistel A, Christos P, Osborne MP (1999) Local and distant recurrence rates in skin-sparing mastectomies compared with non-skin-sparing mastectomies. Ann Surg Oncol 6(7):676–681. PMID: 10560854
13. Simmons RM, Brennan M, Christos P, King V, Osborne M (2002) Analysis of nipple/areolar involvement with mastectomy: can the areola be preserved? Ann Surg Oncol 9(2):165–168. PMID: 11888874
14. Simmons RM, Adamovich TL (2003) Skin-sparing mastectomy. Surg Clin North Am 83(4):885–899. Review. PMID: 12875600
15. Cunnick GH, Mokbel K (2004) Skin-sparing mastectomy. Am J Surg 188(1):78–84. Review. PMID: 15219490
16. Voltura AM, Tsangaris TN, Rosson GD, Jacobs LK, Flores JI, Singh NK, Argani P, Balch CM (2008) Nipple-sparing mastectomy: critical assessment of 51 procedures and implications for selection criteria. Ann Surg Oncol 15(12):3396–3401. doi:10.1245/s10434-008-0102-0. Epub 2008 Oct 16. PMID: 18923874
17. Spear SL, Hannan CM, Willey SC, Cocilovo C (2009) Nipple-sparing mastectomy. Plast Reconstr Surg 123(6):1665–1673. doi:10.1097/PRS.0b013e3181a64d94. PMID: 19483564
18. Gurunluoglu R, Gurunluoglu A, Williams SA, Tebockhorst S (2013) Current trends in breast reconstruction: survey of American Society of Plastic Surgeons 2010. Ann Plast Surg 70(1):103–110. doi:10.1097/SAP.0b013e31822ed5ce. PMID: 21862916
19. Tokin C, Weiss A, Wang-Rodriguez J, Blair SL (2012) Oncologic safety of skin-sparing and nipple-sparing mastectomy: a discussion and review of the literature. Int J Surg Oncol 2012:921821. doi:10.1155/2012/921821. Epub 2012 Jul 17. PMID: 22848803
20. Cemal Y, Albornoz CR, Disa JJ, McCarthy CM, Mehrara BJ, Pusic AL, Cordeiro PG, Matros E (2013) A paradigm shift in U.S. breast reconstruction: part 2. The influence of changing mastectomy patterns on reconstructive rate and method. Plast Reconstr Surg 131(3):320e–326e. doi:10.1097/PRS.0b013e31827cf576. PMID: 23446580
21. Albornoz CR, Bach PB, Mehrara BJ, Disa JJ, Pusic AL, McCarthy CM, Cordeiro PG, Matros E (2013) A paradigm shift in U.S. breast reconstruction: increasing implant rates. Plast Reconstr Surg 131(1):15–23. doi:10.1097/PRS.0b013e3182729cde. PMID: 23271515
22. Yueh JH, Houlihan MJ, Slavin SA, Lee BT, Pories SE, Morris DJ (2009) Nipple-sparing mastectomy: evaluation of patient satisfaction, aesthetic results, and sensation. Ann Plast Surg 62(5):586–590. doi:10.1097/SAP.0b013e31819fb1ac. PMID: 19387167
23. Alderman AK, Wilkins EG, Lowery JC, Kim M, Davis JA (2000) Determinants of patient satisfaction in postmastectomy breast reconstruction. Plast Reconstr Surg 106(4):769–776. PMID: 11007387
24. Colakoglu S, Khansa I, Curtis MS, Yueh JH, Ogunleye A, Haewyon C, Tobias AM, Lee BT (2011) Impact of complications

on patient satisfaction in breast reconstruction. Plast Reconstr Surg 127(4):1428–1436. doi:10.1097/PRS.0b013e318208d0d4. PMID: 21460651
25. Wijayanayagam A, Kumar AS, Foster RD, Esserman LJ (2008) Optimizing the total skin-sparing mastectomy. Arch Surg 143(1):38–45 . doi:10.1001/archsurg.143.1.38discussion 45. PMID: 18209151
26. Petit JY, Gentilini O, Rotmensz N, Rey P, Rietjens M, Garusi C, Botteri E, De Lorenzi F, Martella S, Bosco R, Khuthaila DK, Luini A (2008) Oncological results of immediate breast reconstruction: long term follow-up of a large series at a single institution. Breast Cancer Res Treat 112(3):545–549. doi:10.1007/s10549-008-9891-x. Epub 2008 Jan 22. PMID: 18210199
27. Patani N, Mokbel K (2008) Oncological and aesthetic considerations of skin-sparing mastectomy. Breast Cancer Res Treat 111(3):391–403. Epub 2007 Oct 28. Review. PMID: 17965954
28. Delgado JF, García-Guilarte RF, Palazuelo MR, Mendez JI, Pérez CC (2010) Immediate breast reconstruction with direct, anatomic, gel-cohesive, extra-projection prosthesis: 400 cases. Plast Reconstr Surg 125(6):1599–1605. doi:10.1097/PRS.0b013e3181cb63c2. PMID: 20517082
29. Colwell AS, Damjanovic B, Zahedi B, Medford-Davis L, Hertl C, Austen WG Jr (2011) Retrospective review of 331 consecutive immediate single-stage implant reconstructions with acellular dermal matrix: indications, complications, trends, and costs. Plast Reconstr Surg 128(6):1170–1178. doi:10.1097/PRS.0b013e318230c2f6. PMID: 22094736
30. Salgarello M, Barone-Adesi L, Terribile D, Masetti R (2011) Update on one-stage immediate breast reconstruction with definitive prosthesis after sparing mastectomies. Breast 20(1):7–14. doi:10.1016/j.breast.2010.11.005. Epub 2010 Dec 13. Review. PMID: 21146990
31. Colwell AS, Tessler O, Lin AM, Liao E, Winograd J, Cetrulo CL, Tang R, Smith BL, Austen WG Jr (2014) Breast reconstruction following nipple-sparing mastectomy: predictors of complications, reconstruction outcomes, and 5-year trends. Plast Reconstr Surg 133(3):496–506. doi:10.1097/01.prs.0000438056.67375.75. PMID: 24572843
32. Salzberg CA (2012) Focus on technique: one-stage implant-based breast reconstruction. Plast Reconstr Surg 130(5 Suppl 2):95S–103S. doi:10.1097/PRS.0b013e318262e1a1. Review. PMID: 23096993
33. Salzberg CA (2012) Direct-to-implant breast reconstruction. Clin Plast Surg 39(2):119–126. doi:10.1016/j.cps.2012.01.001. Review. PMID: 22482353
34. Salzberg CA, Ashikari AY, Koch RM, Chabner-Thompson E (2011) An 8-year experience of direct-to-implant immediate breast reconstruction using human acellular dermal matrix (AlloDerm). Plast Reconstr Surg 127(2):514–524. doi:10.1097/PRS.0b013e318200a961. PMID: 21285756
35. Meyer Ganz O, Tobalem M, Perneger T, Lam T, Modarressi A, Elias B, Pittet B (2015) Risks and benefits of using an absorbable mesh in one-stage immediate breast reconstruction: a comparative study. Plast Reconstr Surg 135(3):498e–507e. doi:10.1097/PRS.0000000000001027. PMID: 25719714
36. Tessler O, Reish RG, Maman DY, Smith BL, Austen WG Jr (2014) Beyond biologics: absorbable mesh as a low-cost, low-complication sling for implant-based breast reconstruction. Plast Reconstr Surg 133(2):90e–99e. doi:10.1097/01.prs.0000437253.55457.63. PMID: 24469217
37. Endara M, Chen D, Verma K, Nahabedian MY, Spear SL (2013) Breast reconstruction following nipple-sparing mastectomy: a systematic review of the literature with pooled analysis. Plast Reconstr Surg 132(5):1043–1054. doi:10.1097/PRS.0b013e3182a48b8a. Review. PMID: 23924650
38. Albornoz CR, Cordeiro PG, Farias-Eisner G, Mehrara BJ, Pusic AL, McCarthy CM, Disa JJ, Hudis CA, Matros E (2014) Diminishing relative contraindications for immediate breast reconstruction. Plast Reconstr Surg 134(3):363e–369e. doi:10.1097/PRS.0000000000000478. PMID: 25158715
39. De Vita R, Buccheri EM, Pozzi M, Zoccali G (2014) Direct to implant breast reconstruction by using SERI, preliminary report. J Exp Clin Cancer Res 33:78. doi:10.1186/s13046-014-0078-5. PMID: 25422034
40. Lee KT, Mun GH (2015) Comparison of one-stage vs two-stage prosthesis-based breast reconstruction: a systematic review and meta-analysis. Am J Surg 212(2):336–344. doi:10.1016/j.amjsurg.2015.07.015pii: S0002-9610(15)00534-6. Review. PMID: 26499053
41. Colwell AS (2012) Direct-to-implant breast reconstruction. Gland Surg 1(3):139–141. PMID: 25083436
42. King IC, Harvey JR, Bhaskar P (2014) One-stage breast reconstruction using the inferior dermal flap, implant, and free nipple graft. Aesthet Plast Surg 38(2):358–364. doi:10.1007/s00266-014-0276-8. Epub 2014 Jan 30. PMID: 24477522
43. Kim YW, Kim YJ, Kong JS, Cheon YW (2014) Use of the pectoralis major, serratus anterior, and external oblique fascial flap for immediate one-stage breast reconstruction with implant. Aesthet Plast Surg 38(4):704–710. doi:10.1007/s00266-014-0351-1. Epub 2014 Jun 7. PMID: 24907100
44. Petit JY, Rietjens M, Lohsiriwat V, Rey P, Garusi C, De Lorenzi F, Martella S, Manconi A, Barbieri B, Clough KB (2012) Update on breast reconstruction techniques and indications. World J Surg 36(7):1486–1497. doi:10.1007/s00268-012-1486-3. PMID: 22395342
45. Stevens WG, Harrington J, Alizadeh K, Berger L, Broadway D, Hester TR, Kress D, d'Incelli R, Kuhne J, Beckstrand M (2012) Five-year follow-up data from the U.S. clinical trial for Sientra's U.S. Food and Drug Administration-approved Silimed® brand round and shaped implants with high-strength silicone gel. Plast Reconstr Surg 130(5):973–981. doi:10.1097/PRS.0b013e31826b7d2f. PMID: 23096598
46. Hammond DC, Migliori MM, Caplin DA, Garcia ME, Phillips CA (2012) Mentor contour profile gel implants: clinical outcomes at 6 years. Plast Reconstr Surg 129(6):1381–1391. doi:10.1097/PRS.0b013e31824ecbf0. PMID: 22327894
47. Maxwell GP, Van Natta BW, Murphy DK, Slicton A, Bengtson BP (2012) Natrelle style 410 form-stable silicone breast implants: core study results at 6 years. Aesthet Surg J 32(6):709–717. doi:10.1177/1090820X12452423. Epub 2012 Jun 29 PMID: 22751081
48. Salzberg CA, Dunavant C, Nocera N (2013) Immediate breast reconstruction using porcine acellular dermal matrix (Strattice™): long-term outcomes and complications. J Plast Reconstr Aesthet Surg 66(3):323–328. doi:10.1016/j.bjps.2012.10.015. Epub 2012 Nov 13. PMID: 23153519
49. Breuing KH, Warren SM (2005) Immediate bilateral breast reconstruction with implants and inferolateral AlloDerm slings. Ann Plast Surg 55(3):232–239. PMID: 16106158
50. Breuing KH, Colwell AS (2007) Inferolateral AlloDerm hammock for implant coverage in breast reconstruction. Ann Plast Surg 59(3):250–255. PMID: 17721209
51. Dieterich M, Paepke S, Zwiefel K, Dieterich H, Blohmer J, Faridi A, Klein E, Gerber B, Nestle-Kraemling C (2013) Implant-based breast reconstruction using a titanium-coated polypropylene mesh (TiLOOP bra): a multicenter study of 231 cases. Plast Reconstr Surg 132(1):8e–19e. doi:10.1097/PRS.0b013e318290f8a0. PMID: 23806958
52. Rulli A, Caracappa D, Castellani E, Arcuri G, Barberini F, Sanguinetti A, Noya G, Pataia E, Covarelli P (2013) Optimizing therapeutic timing in patients undergoing mastectomy through use of the Tiloop® synthetic mesh: single-step surgery. In Vivo 27(3):383–386. PMID: 23606695
53. Scheflan M, Colwell AS (2014) Tissue reinforcement in implant-based breast reconstruction. Plast Reconstr Surg Glob Open

2(8):e192. doi:10.1097/GOX.0000000000000140. eCollection 2014 Aug. PMID: 25426375
54. Reitsamer R, Peintinger F (2015) Prepectoral implant placement and complete coverage with porcine acellular dermal matrix: a new technique for direct-to-implant breast reconstruction after nipple-sparing mastectomy. J Plast Reconstr Aesthet Surg 68(2):162–167. doi:10.1016/j.bjps.2014.10.012. Epub 2014 Oct 16. PMID: 25455288
55. Govshievich A, Somogyi RB, Brown MH (2015) Conservative mastectomies and immediate reconstruction with the use of ADMs. Gland Surg. 4(6):453–462. doi:10.3978/j.issn.2227-684X.2015.02.03. PMID: 26644999
56. Apte A, Walsh M, Chandrasekharan S, Chakravorty A (2016) Single-stage immediate breast reconstruction with acellular dermal matrix: experience gained and lessons learnt from patient reported outcome measures. Eur J Surg Oncol 42(1):39–44. doi:10.1016/j.ejso.2015.10.009. Epub 2015 Nov 2. PMID: 26651226
57. Rodriguez-Unda N, Leiva S, Cheng HT, Seal SM, Cooney CM, Rosson GD (2015) Low incidence of complications using polyglactin 910 (Vicryl) mesh in breast reconstruction: a systematic review. J Plast Reconstr Aesthet Surg 68(11):1543–1549. doi:10.1016/j.bjps.2015.06.018. Epub 2015 Jun 29. Review. PMID: 26275493
58. Rodriguez-Feliz J, Codner MA (2015) Embrace the change: incorporating single-stage implant breast reconstruction into your practice. Plast Reconstr Surg 136(2):221–231. doi:10.1097/PRS.0000000000001448. PMID: 26218372
59. Hille-Betz U, Kniebusch N, Wojcinski S, Henseler H, Heyl V, Ohlinger R, Paepke S, Klapdor R, Krause-Bergmann B (2015) Breast reconstruction and revision surgery for implant-associated breast deformities using porcine acellular dermal matrix: a multicenter study of 156 cases. Ann Surg Oncol 22(4):1146–1152. doi:10.1245/s10434-014-4098-3. Epub 2014 Oct 10. PMID: 25300607
60. Gerber B, Marx M, Untch M, Faridi A (2015) Breast reconstruction following cancer treatment. Dtsch Arztebl Int 112(35-36):593–600. doi:10.3238/arztebl.2015.0593. PMID: 26377531
61. Lee KT, Mun GH (2016) Updated evidence of acellular dermal matrix use for implant-based breast reconstruction: a meta-analysis. Ann Surg Oncol 23(2):600–610. doi:10.1245/s10434-015-4873-9. Epub 2015 Oct 5. PMID: 26438439
62. Martin L, O'Donoghue JM, Horgan K, Thrush S, Johnson R, Gandhi A, Association of Breast Surgery and the British Association of Plastic, Reconstructive and Aesthetic Surgeons (2013) Acellular dermal matrix (ADM) assisted breast reconstruction procedures: joint guidelines from the Association of Breast Surgery and the British Association of Plastic, Reconstructive and Aesthetic Surgeons. Eur J Surg Oncol 39(5):425–429. doi:10.1016/j.ejso.2012.12.012. Epub 2013 Jan 13. PMID: 23321393
63. Petit JY, Veronesi U, Lohsiriwat V, Rey P, Curigliano G, Martella S, Garusi C, De Lorenzi F, Manconi A, Botteri E, Didier F, Orecchia R, Rietjens M (2011) Nipple-sparing mastectomy—is it worth the risk? Nat Rev Clin Oncol 8(12):742–747. doi:10.1038/nrclinonc.2011.159. PMID: 22024947
64. Fortunato L, Loreti A, Andrich R, Costarelli L, Amini M, Farina M, Santini E, Vitelli CE (2013) When mastectomy is needed: is the nipple-sparing procedure a new standard with very few contraindications? J Surg Oncol 108(4):207–212. doi:10.1002/jso.23390. Epub 2013 Aug 1. PMID: 23913775
65. Hamza AM, Rietjens M (2013) Immediate breast reconstruction: does the pathology affect the reconstruction? Gland Surg 2(3):124–125. doi:10.3978/j.issn.2227-684X.2013.07.02. PMID: 25083472
66. Munhoz AM, Montag E, Filassi JR, Gemperli R (2014) Immediate nipple-areola-sparing mastectomy reconstruction: an update on oncological and reconstruction techniques. World J Clin Oncol 5(3):478–494. doi:10.5306/wjco.v5.i3.478. Review. PMID: 25114861.
67. Eisenberg RE, Chan JS, Swistel AJ, Hoda SA (2014) Pathological evaluation of nipple-sparing mastectomies with emphasis on occult nipple involvement: the Weill-Cornell experience with 325 cases. Breast J 20(1):15–21. doi:10.1111/tbj.12199. PMID: 24438063
68. Camp MS, Coopey SB, Tang R, Colwell A, Specht M, Greenup RA, Gadd MA, Brachtel E, Austen WG Jr, Smith BL (2014) Management of positive sub-areolar/nipple duct margins in nipple-sparing mastectomies. Breast J 20(4):402–407. doi:10.1111/tbj.12279. Epub 2014 Jun 2. PMID: 24890641
69. Kesson EM, Allardice GM, George WD, Burns HJ, Morrison DS (2012) Effects of multidisciplinary team working on breast cancer survival: retrospective, comparative, interventional cohort study of 13 722 women. BMJ 344:e2718. doi:10.1136/bmj.e2718. PMID: 22539013
70. Chung KC, Hamill JB, Kim HM, Walters MR, Wilkins EG (1999) Predictors of patient satisfaction in an outpatient plastic surgery clinic. Ann Plast Surg 42(1):56–60. PMID: 9972719
71. Nahabedian MY, Tsangaris T, Momen B, Manson PN (2003) Infectious complications following breast reconstruction with expanders and implants. Plast Reconstr Surg 112(2):467–476. PMID: 12900604
72. Classen J, Nitzsche S, Wallwiener D, Kristen P, Souchon R, Bamberg M, Brucker S (2010) Fibrotic changes after postmastectomy radiotherapy and reconstructive surgery in breast cancer. A retrospective analysis in 109 patients. Strahlenther Onkol 186(11):630–636. doi:10.1007/s00066-010-2158-6. Epub 2010 Nov 8. PMID: 21072625
73. Barry M, Kell MR (2011) Radiotherapy and breast reconstruction: a meta-analysis. Breast Cancer Res Treat 127(1):15–22. doi:10.1007/s10549-011-1401-x. Epub 2011 Feb 20. Review. PMID: 21336948
74. Nava MB, Pennati AE, Lozza L, Spano A, Zambetti M, Catanuto G (2011) Outcome of different timings of radiotherapy in implant-based breast reconstructions. Plast Reconstr Surg 128(2):353–359. doi:10.1097/PRS.0b013e31821e6c10. PMID: 21788827
75. Reish RG, Lin A, Phillips NA, Winograd J, Liao EC, Cetrulo CL Jr, Smith BL, Austen WG Jr, Colwell AS (2015) Breast reconstruction outcomes after nipple-sparing mastectomy and radiation therapy. Plast Reconstr Surg 135(4):959–966. doi:10.1097/PRS.0000000000001129. PMID: 25811561
76. Colwell AS (2015) Current strategies with 1-stage prosthetic breast reconstruction. Gland Surg. 4(2):111–115. doi:10.3978/j.issn.2227-684X.2015.02.05. Review. PMID: 26005643
77. Cordeiro PG, Albornoz CR, McCormick B, Hudis CA, Hu Q, Heerdt A, Matros E (2015) What is the optimum timing of postmastectomy radiotherapy in two-stage prosthetic reconstruction: radiation to the tissue expander or permanent implant? Plast Reconstr Surg 135(6):1509–1517. PMID: 25742523
78. Agarwal S, Kidwell KM, Farberg A, Kozlow JH, Chung KC, Momoh AO (2015) Immediate reconstruction of the radiated breast: recent trends contrary to traditional standards. Ann Surg Oncol 22(8):2551–2559. doi:10.1245/s10434-014-4326-x. Epub 2015 Jan 7. PMID: 25564172
79. Ribuffo D, Lo Torto F, Giannitelli SM, Urbini M, Tortora L, Mozetic P, Trombetta M, Basoli F, Licoccia S, Tombolini V, Cassese R, Scuderi N, Rainer A (2015) The effect of postmastectomy radiation therapy on breast implants: unveiling biomaterial alterations with potential implications on capsular contracture. Mater Sci Eng C Mater Biol Appl 57:338–343. doi:10.1016/j.msec.2015.07.015. Epub 2015 Jul 18. PMID: 26354273
80. El-Sabawi B, Carey JN, Hagopian TM, Sbitany H, Patel KM (2016) Radiation and breast reconstruction: algorithmic approach

and evidence-based outcomes. J Surg Oncol. doi:10.1002/jso.24143. Review. PMID: 26750435
81. Fischer JP, Wes AM, Tuggle CT 3rd, Serletti JM, Wu LC (2013) Risk analysis of early implant loss after immediate breast reconstruction: a review of 14,585 patients. J Am Coll Surg 217(6):983–990. doi:10.1016/j.jamcollsurg.2013.07.389. Epub 2013 Aug 21. PMID: 23973103
82. Dent BL, Small K, Swistel A, Talmor M (2014) Nipple-areolar complex ischemia after nipple-sparing mastectomy with immediate implant-based reconstruction: risk factors and the success of conservative treatment. Aesthet Surg J 34(4):560–570. doi:10.1177/1090820X14528352. Epub 2014 Mar 28. PMID: 24682442
83. Algaithy ZK, Petit JY, Lohsiriwat V, Maisonneuve P, Rey PC, Baros N, Lai H, Mulas P, Barbalho DM, Veronesi P, Rietjens M (2012) Nipple sparing mastectomy: can we predict the factors predisposing to necrosis? Eur J Surg Oncol 38(2):125–129. doi:10.1016/j.ejso.2011.10.007. Epub 2011 Nov 6. PMID: 22056645
84. Lin KY, Johns FR, Gibson J, Long M, Drake DB, Moore MM (2001) An outcome study of breast reconstruction: presurgical identification of risk factors for complications. Ann Surg Oncol 8(7):586–591. PMID: 11508620
85. Khullar D, Maa J (2012) The impact of smoking on surgical outcomes. J Am Coll Surg 215(3):418–426. doi:10.1016/j.jamcollsurg.2012.05.023. Epub 2012 Jul 12. Review. No abstract available. PMID: 22795477
86. Coon D, Tuffaha S, Christensen J, Bonawitz SC (2013) Plastic surgery and smoking: a prospective analysis of incidence, compliance, and complications. Plast Reconstr Surg 131(2):385–391. doi:10.1097/PRS.0b013e318277886a. PMID: 23358000
87. Munabi NC, Olorunnipa OB, Goltsman D, Rohde CH, Ascherman JA (2014) The ability of intra-operative perfusion mapping with laser-assisted indocyanine green angiography to predict mastectomy flap necrosis in breast reconstruction: a prospective trial. J Plast Reconstr Aesthet Surg 67(4):449–455. doi:10.1016/j.bjps.2013.12.040. Epub 2013 Dec 31. PMID: 24507962
88. Cordeiro PG, McCarthy CM (2006) A single surgeon's 12-year experience with tissue expander/implant breast reconstruction: part II. An analysis of long-term complications, aesthetic outcomes, and patient satisfaction. Plast Reconstr Surg 118(4):832–839. PMID: 16980843
89. Cordeiro PG, McCarthy CM (2006) A single surgeon's 12-year experience with tissue expander/implant breast reconstruction: part I. A prospective analysis of early complications. Plast Reconstr Surg 118(4):825–831. PMID: 16980842
90. Wang F, Peled AW, Garwood E, Fiscalini AS, Sbitany H, Foster RD, Alvarado M, Ewing C, Hwang ES, Esserman LJ (2014) Total skin-sparing mastectomy and immediate breast reconstruction: an evolution of technique and assessment of outcomes. Ann Surg Oncol 21(10):3223–3230. doi:10.1245/s10434-014-3915-z. Epub 2014 Jul 23. PMID: 25052246
91. Maclin MM 2nd, Deigni OA, Bengtson BP (2015) The laminated nature of the pectoralis major muscle and the redefinition of the inframammary fold: clinical implications in aesthetic and reconstructive breast surgery. Clin Plast Surg 42(4):465–479. doi:10.1016/j.cps.2015.06.011. Epub 2015 Aug 11. Review. PMID: 26408437
92. Takami Y, Matsuda T, Yoshitake M, Hanumadass M, Walter RJ (1996) Dispase/detergent treated dermal matrix as a dermal substitute. Burns 22(3):182–190. PMID: 8726254
93. Salzberg CA (2006) Nonexpansive immediate breast reconstruction using human acellular tissue matrix graft (AlloDerm). Ann Plast Surg 57(1):1–5. PMID: 16799299
94. Nahabedian MY (2009) AlloDerm performance in the setting of prosthetic breast surgery, infection, and irradiation. Plast Reconstr Surg 124(6):1743–1753. doi:10.1097/PRS.0b013e3181bf8087. PMID: 19952629
95. Butterfield JL (2013) 440 consecutive immediate, implant-based, single-surgeon breast reconstructions in 281 patients: a comparison of early outcomes and costs between SurgiMend fetal bovine and AlloDerm human cadaveric acellular dermal matrices. Plast Reconstr Surg 131(5):940–951. doi:10.1097/PRS.0b013e3182865ab3. PMID: 23629076
96. Jansen LA, Macadam SA (2011) The use of AlloDerm in postmastectomy alloplastic breast reconstruction: part II. A cost analysis. Plast Reconstr Surg 127(6):2245–2254. doi:10.1097/PRS.0b013e3182131c6b. Review. PMID: 21617459
97. Ganske I, Verma K, Rosen H, Eriksson E, Chun YS (2013) Minimizing complications with the use of acellular dermal matrix for immediate implant-based breast reconstruction. Ann Plast Surg 71(5):464–470. doi:10.1097/SAP.0b013e3182a7cc9b. PMID: 24126333
98. Rundell VL, Beck RT, Wang CE, Gutowski KA, Sisco M, Fenner G, Howard MA (2014) Complication prevalence following use of tutoplast-derived human acellular dermal matrix in prosthetic breast reconstruction: a retrospective review of 203 patients. J Plast Reconstr Aesthet Surg 67(10):1345–1351. doi:10.1016/j.bjps.2014.05.032. Epub 2014 May 28. PMID: 24917371
99. Berna G, Cawthorn SJ, Papaccio G, Balestrieri N (2014) Evaluation of a novel breast reconstruction technique using the Braxon® acellular dermal matrix: a new muscle-sparing breast reconstruction. ANZ J Surg. doi:10.1111/ans.12849. [Epub ahead of print] PMID: 25266930
100. Woo A, Harless C, Jacobson SR (2015) Revisiting an old place: single surgeon experience on post-mastectomy subcutaneous implant based breast reconstruction. Plast Reconstr Surg 136(4 Suppl):83. doi:10.1097/01.prs.0000472382.57985.19. No abstract available. PMID: 26397592
101. Leone MS, Priano V, Franchelli S, Puggioni V, Merlo DF, Mannucci M, Santi PL (2011) Factors affecting symmetrization of the contralateral breast: a 7-year unilateral postmastectomy breast reconstruction experience. Aesthet Plast Surg 35(4):446–451. doi:10.1007/s00266-010-9622-7. Epub 2010 Dec 7. PMID: 21136255
102. Salgarello M, Visconti G, Barone-Adesi L, Franceschini G, Masetti R (2015) Contralateral breast symmetrisation in immediate prosthetic breast reconstruction after unilateral nipple-sparing mastectomy: the tailored reduction/augmentation mammaplasty. Arch Plast Surg 42(3):302–308. doi:10.5999/aps.2015.42.3.302. Epub 2015 May 14. PMID: 26015885
103. Pinell-White XA, Kolegraff K, Carlson GW (2014) Predictors of contralateral prophylactic mastectomy and the impact on breast reconstruction. Ann Plast Surg 72(6):S153–S157. doi:10.1097/SAP.0000000000000099. PMID: 24691345
104. Silva AK, Lapin B, Yao KA, Song DH, Sisco M (2015) The effect of contralateral prophylactic mastectomy on perioperative complications in women undergoing immediate breast reconstruction: a NSQIP analysis. Ann Surg Oncol 22(11):3474–3480. doi:10.1245/s10434-015-4628-7. Epub 2015 May 22. PMID: 26001862
105. Couch FJ, Nathanson KL, Offit K (2014) Two decades after BRCA: setting paradigms in personalized cancer care and prevention. Science 343(6178):1466–1470. doi:10.1126/science.1251827. PMID: 24675953
106. van Verschuer VM, Mureau MA, Gopie JP, Vos EL, Verhoef C, Menke-Pluijmers MB, Koppert LB (2014) Patient satisfaction and nipple-areola sensitivity after bilateral prophylactic mastectomy and immediate implant breast reconstruction in a high breast cancer risk population: nipple-sparing mastectomy versus skin-sparing mastectomy. Ann Plast Surg 77(2):145–152. [Epub ahead of print] PMID: 26076217
107. Darouiche RO, Wall MJ Jr, Itani KM, Otterson MF, Webb AL, Carrick MM, Miller HJ, Awad SS, Crosby CT, Mosier MC, Alsharif A, Berger DH (2010) Chlorhexidine-alcohol versus

povidone-iodine for surgical-site antisepsis. N Engl J Med 362(1):18–26. doi:10.1056/NEJMoa0810988. PMID: 20054046
108. Yalanis GC, Liu EW, Cheng HT (2015) Efficacy and safety of povidone-iodine irrigation in reducing the risk of capsular contracture in aesthetic breast augmentation: a systematic review and meta-analysis. Plast Reconstr Surg 136(4):687–698. doi:10.1097/PRS.0000000000001576. Review. PMID: 26397246
109. Rietjens M, De Lorenzi F, Andrea M, Chirappapha P, Martella S, Barbieri B, Gottardi A, Giuseppe L, Hamza A, Petit JY, Lohsiriwat V (2013) Free nipple graft technique to correct nipple and areola malposition after breast procedures. Plast Reconstr Surg Glob Open 1(8):e69. doi:10.1097/GOX.0000000000000002. eCollection 2013 Nov. PMID: 25289264
110. Basta MN, Gerety PA, Serletti JM, Kovach SJ, Fischer JP (2015) A systematic review and head-to-head meta-analysis of outcomes following direct-to-implant versus conventional two-stage implant reconstruction. Plast Reconstr Surg 136(6):1135–1144. doi:10.1097/PRS.0000000000001749. PMID: 26595013
111. Lardi AM, Ho-Asjoe M, Mohanna PN, Farhadi J (2014) Immediate breast reconstruction with acellular dermal matrix: factors affecting outcome. J Plast Reconstr Aesthet Surg 67(8):1098–1105. doi:10.1016/j.bjps.2014.05.020. Epub 2014 May 20. PMID: 24927863
112. Chirappapha P, Petit JY, Rietjens M, De Lorenzi F, Garusi C, Martella S, Barbieri B, Gottardi A, Andrea M, Giuseppe L, Hamza A, Lohsiriwat V (2014) Nipple sparing mastectomy: does breast morphological factor related to necrotic complications? Plast Reconstr Surg Glob Open 2(1):e99. doi:10.1097/GOX.0000000000000038. eCollection 2014 Jan. PMID: 25289296
113. de Jong D, Vasmel WL, de Boer JP, Verhave G, Barbé E, Casparie MK, van Leeuwen FE (2008) Anaplastic large-cell lymphoma in women with breast implants. JAMA 300(17):2030–2035. doi:10.1001/jama.2008.585. PMID: 18984890
114. Kim B, Roth C, Chung KC, Young VL, van Busum K, Schnyer C, Mattke S (2011) Anaplastic large cell lymphoma and breast implants: a systematic review. Plast Reconstr Surg 127(6):2141–2150. doi:10.1097/PRS.0b013e3182172418. Review. PMID: 21358562
115. Cohen JB, Carroll C, Tenenbaum MM, Myckatyn TM (2015) Breast implant-associated infections: the role of the national surgical quality improvement program and the local microbiome. Plast Reconstr Surg 136(5):921–929. doi:10.1097/PRS.0000000000001682. PMID: 26505698
116. Craft RO, Damjanovic B, Colwell AS (2012) Evidence-based protocol for infection control in immediate implant-based breast reconstruction. Ann Plast Surg 69(4):446–450. doi:10.1097/SAP.0b013e31824a215a. PMID: 22964685
117. Franchelli S, Pesce M, Savaia S, Marchese A, Barbieri R, Baldelli I, De Maria A (2015) Clinical and microbiological characterization of late breast implant infections after reconstructive breast cancer surgery. Surg Infect 16(5):636–644. doi:10.1089/sur.2014.146. Epub 2015 Jul 14. PMID: 26171650
118. Cher DJ, Conwell JA, Mandel JS (2001) MRI for detecting silicone breast implant rupture: meta-analysis and implications. Ann Plast Surg 47(4):367–380. PMID: 11601570
119. McCarthy CM, Pusic AL, Kerrigan CL (2008) Silicone breast implants and magnetic resonance imaging screening for rupture: do U.S. Food and Drug Administration recommendations reflect an evidence-based practice approach to patient care? Plast Reconstr Surg 121(4):1127–1134. doi:10.1097/01.prs.0000302498.44244.52. Review. PMID: 18349629
120. Rietjens M, Villa G, Toesca A, Rizzo S, Raimondi S, Rossetto F, Sangalli C, De Lorenzi F, Manconi A, Gustavo A, Matthes Z, Chahuan B, Brenelli F, Bellomi M, Petit JY (2014) Appropriate use of magnetic resonance imaging and ultrasound to detect early silicone gel breast implant rupture in postmastectomy reconstruction. Plast Reconstr Surg 134(1):13e–20e. doi:10.1097/PRS.0000000000000291. PMID: 25028829
121. Kuroda F, Urban C, Zucca-Matthes G, de Oliveira VM, Arana GH, Iera M, Rietjens M, Santos G, Spagnol C, de Lima RS (2016) Evaluation of aesthetic and quality-of-life results after immediate breast reconstruction with definitive form-stable anatomical implants. Plast Reconstr Surg 137(2):278e–286e. doi:10.1097/01.prs.0000475746.17968.f4. PMID: 26818317
122. Momoh AO, Ahmed R, Kelley BP, Aliu O, Kidwell KM, Kozlow JH, Chung KC (2014) A systematic review of complications of implant-based breast reconstruction with prereconstruction and postreconstruction radiotherapy. Ann Surg Oncol 21(1):118–124. doi:10.1245/s10434-013-3284-z. Epub 2013 Oct 1. Review. PMID: 24081801
123. Gfrerer L, Mattos D, Mastroianni M, Weng QY, Ricci JA, Heath MP, Lin A, Specht MC, Haynes AB, Austen WG Jr, Liao EC (2015) Assessment of patient factors, surgeons, and surgeon teams in immediate implant-based breast reconstruction outcomes. Plast Reconstr Surg 135(2):245e–252e. Review. PMID: 25626807
124. Susarla SM, Ganske I, Helliwell L, Morris D, Eriksson E, Chun YS (2015) Comparison of clinical outcomes and patient satisfaction in immediate single-stage versus two-stage implant-based breast reconstruction. Plast Reconstr Surg 135(1):1e–8e. doi:10.1097/PRS.0000000000000803. PMID: 25539329
125. Roostaeian J, Sanchez I, Vardanian A, Herrera F, Galanis C, Da Lio A, Festekjian J, Crisera CA (2012) Comparison of immediate implant placement versus the staged tissue expander technique in breast reconstruction. Plast Reconstr Surg 129(6):909e–918e. doi:10.1097/PRS.0b013e31824ec411. PMID: 22634689