Impact of different type of cancer treatment on the effectiveness of breast reconstruction

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Abstract: For women undergoing mastectomy as part of their breast cancer treatment, breast reconstruction is an important part of therapy. However, neoadjuvant, adjuvant treatments as well as other patient-related factors can compromise the results of breast reconstruction techniques. In this article we have reviewed current approaches to the management of complications and risks that neoadjuvant and adjuvant therapies pose on breast reconstruction after mastectomy for breast cancer. Non-treatment related factors influencing reconstruction techniques were reviewed as well.

Keywords: Breast cancer; reconstruction techniques; radiation therapy

Submitted Apr 27, 2016. Accepted for publication May 18, 2016.
doi: 10.21037/gs.2016.05.06
View this article at: http://dx.doi.org/10.21037/gs.2016.05.06

Introduction

Breast cancer stands for nearly 12% of all new cancer cases and almost 25% of all cancers in women worldwide with nearly 1.7 million new cases identified each year. A multidisciplinary approach that includes medical oncologist, cancer surgeon and radiation oncologist have considerably reduced mortality caused by breast cancer. A good medical outcome is often reached at an important psychological price associated with post mastectomy depression and lower self-image. Therefore, a significant improvement of patient's quality of life can be obtained thanks to immediate or delayed breast reconstruction. Large proportion of breast cancer patients qualifies for breast conservation therapy comprising excision of the tumor, sentinel node biopsy and radiation therapy. Unfortunately there still exist a range of contraindications for this procedure (i.e., multicentric disease, inflammatory breast cancer, expected unfavorable cosmetic outcome, BRCA1 and BRCA2 mutations, previous radiotherapy) which results in several patients requiring mastectomy. Those patients are potential candidates for reconstructive procedures, that can be performed during primary surgery or as an independent procedure. However, during treatment planning one have to take into account that those patients may require other therapeutic steps such as sentinel node biopsy, axillary lymph node dissection, post mastectomy radiation therapy, neoadjuvant and adjuvant chemotherapy or hormonal therapy. All those techniques are burdened with the occurrence of adverse effects that may potentially interfere with reconstructive procedures. Local or general complications in patients, who underwent reconstructive treatment, such as wound breakdown, skin necrosis, infections requiring oral or intravenous antibiotics, could lead to implant loss decreasing chances for a satisfying cosmetic effect. On the other hand, several complications of reconstruction techniques (especially infectious complications) can delay chemotherapy and thus interfere with chances for a long term survival. The negative impact of other factors, such as smoking, age, high body mass index on the results of breast reconstruction techniques should also be taken into account. The aim of this study is to review the impact of different types of cancer treatment on the results of breast reconstruction techniques.

Chemotherapy

Traditionally, neoadjuvant chemotherapy was reserved for more locally advanced breast tumors. Today, we can
observe that the indications for neoadjuvant chemotherapy in patients with breast cancer are increasing. Neoadjuvant chemotherapy can lead to a larger proportion of patients being candidates for breast conserving therapy, even in patients with lobular histology (downstaging in lobular cancers is less frequent than in ductal cancers) (1). Adjuvant chemotherapy is often needed to achieve adequate breast cancer control. It is used in a large proportion of all breast cancer patients with an exception of early Luminal type A tumors. Numerous studies support the opinion that neither neoadjuvant nor adjuvant chemotherapy increase the rate of complications or implant failure in patients undergoing post mastectomy expander/implants breast reconstruction, including in patients who undergo tissue expansion at the time of chemotherapy (2-4). However, there are ongoing discussions on how to choose the ideal moment for a reconstruction procedure, depending on different chemotherapy regimen received by the breast cancer patient. Some authors claim that immediate reconstruction can be safely integrated with chemotherapy without a significant impact on complications (5,6). Recent French report suggests that Skin-Sparing Mastectomy and reconstruction with a latissimus dorsi flap could be safely performed after neoadjuvant chemo- and radiotherapy, with an acceptable rate of flap necrosis in a selected group of patients (7). Patients who receive neoadjuvant chemotherapy are less likely to undergo immediate reconstruction, even though they are no more likely to undergo delayed reconstruction than patients receiving adjuvant chemotherapy (8,9). Also it has been shown that premature removal of a tissue expander occurs more commonly in patients treated with neoadjuvant or adjuvant chemotherapy and is most commonly observed 2–3 months after placement (10). Nevertheless the direct negative influence of neoadjuvant and adjuvant chemotherapy on rate of complications after reconstructive procedures has not been proven. Because of the contradictory data this topic requires further studies.

Hormonal therapy

Adjuvant hormonal therapy is recommended for at least five years in patients with hormone receptor-positive breast cancers. The available options include tamoxifen, aromatase inhibitors, and fulvestrant (11-16). A prospective randomized trial performed in 1995, comparing modified radical mastectomy to hormone therapy followed by modified radical mastectomy found that there was no significant difference in the risk of complications and that immediate breast reconstruction was not an independent predictor of complications (17). This opinion has been maintained by a study from 2016, even though it has been observed, that the group of patients who received adjuvant hormonal therapy after mastectomy, were initially presenting more advanced stage of the disease, were more likely to receive post mastectomy radiation therapy and had a greater risk of axillary lymph node dissection (11).

Anty HER-2 therapy

The adjuvant therapy with trastuzumab, a fully humanized monoclonal antibody developed to target the extra cellular domain of HER-2 (human epidermal growth factor receptor-2, a gene whose amplification was estimated to be present in 15–20% of breast cancer patients, playing role in epithelial cell mitosis, invasion, and antiapoptosis) was suggested to coincide with the timing of tissue-implant exchange in patients who have undergone immediate prosthetic breast reconstruction. This suggestion was associated with the fact that treatment with trastuzumab may require receiving ongoing infusions for up to 12 months. However, since patients with HER2-overexpression have a relatively higher risk of local recurrence, they are less likely to receive immediate breast reconstruction in general (18). Further investigations are required to specify the impact of trastuzumab on the possibility of post-mastectomy reconstructive surgery.

Radiation therapy

Post-mastectomy radiation in a subset of node-positive and/or small tumor-free margin patients has a significant impact on reducing the rate of mortality and local recurrence. On the other hand, radiotherapy is associated with increased complications and poorer aesthetic outcomes following both autologous tissue and implant-based breast reconstructions (19-21). The long-term effects of radiation therapy include microvascular damage, fibroblast dysfunction, decreased and disorganized collagen deposition, decreased angiogenesis and decreased wound tensile strength. These factors can lead to difficulties such as an increased risk of wound breakdown, infections requiring oral or intravenous antibiotics, additional surgical procedures, implant exposure or implant loss (22). Also nipple necrosis after nipple-sparing mastectomy has been associated with preoperative irradiation.
The optimal timing of radiotherapy and breast reconstruction is still a subject of debate (11). Patients receiving the alloplastic prosthesis, form a distinct group than those treated with autologous tissue reconstruction. The sequence and timing of tissue expansion and implant exchange with regard to post mastectomy radiation therapy may influence complication rates. For instance, some authors suggest that delaying expander-implant exchange for at least six months after the completion of post mastectomy radiation therapy can reduce the risk of expander-implant failure (21). Moreover, patients who undergo post mastectomy radiation therapy generally wait longer for their tissue expander—implant exchange, which means that there is a greater window for physicians to start hormonal therapy in these patients (11). In general, an irradiated field poses important challenges to implant-based breast reconstruction. Therefore, patients should be carefully screened for all risk factors and selected for this procedure accordingly having in mind its limitations in this particular group of patients (23).

A slightly different scenario appears when autologous reconstruction with microvascular flaps is performed. Some authors state that autologous breast reconstruction can be performed safely regardless of preoperative or postoperative radiation therapy. Indeed, there are no significant differences in complication rates or number of surgical interventions depending on the type of free flap (24). Multiple studies have demonstrated reduced complications and failure rates after autologous reconstruction as compared to implant-based reconstructions. However, irradiation continuously causes a wide range of effects, such as stromal atrophy, fat necrosis, contracture and breast asymmetry. Nevertheless it is believed that in patients, who have had tissue expanders placed and underwent unanticipated post mastectomy radiation therapy, delayed-immediate autologous reconstruction may be offered after radiation therapy has been completed (25). If these patients ultimately undergo tissue expander implant exchange, the use of implants that are smaller than expander volume is suggested to decrease wound tension and skin stress and facilitate wound healing. Again, the timing of the reconstructive procedure remains controversial. Delayed or delayed-immediate autologous reconstructions are proposed as an effective options for reducing the risk of radiation-induced contour-irregularities (11,19). Some studies suggest 12 months interval as a safe period after primary surgical treatment, after which significant decrease in rate of complications is observed (26).

Local recurrence in the previously irradiated field, although rare, could be a devastating event. Surgical treatment may frequently require large resections including part of thoracic cage with complicated reconstructions with microvascular autologous flaps or contralateral breast and always require excision of the implant (27). The cosmetic outcomes of such operations are poor.

Axillary lymph node dissection

Axillary dissection was considered as the gold standard for all patients with positive sentinel lymph node. In 2011, a bold study by Giuliano et al. showed that in patients with T1-T2 tumors with no palpable adenopathy and with 1 to 2 positive lymph nodes on sentinel node biopsy axillary dissection is not superior to no axillary dissection. All patients received appropriate systemic and radiation therapy and showed no statistical difference in overall survival and in disease free survival after a median of 6.3 years (28). Based on these data it has been suggested that the routine use of axillary lymph node dissection could be safely omitted in women with early diagnosed breast cancer who have only one or two positive sentinel nodes. The debate whether sentinel lymph node biopsy with radiation therapy may achieve the same long-term oncologic outcomes as axillary lymph node dissection for a selected group of patients is ongoing as well as several randomized studies aiming at evaluating this approach (11,29-33). If indeed the axillary dissection could be spared for a large group of patients it would be beneficial for them not only in terms of avoiding typical short and long term complications associated with this procedure but also, it would mean lower risk of implant loss for those undergoing reconstruction (11). In patients with positive sentinel node undergoing a mastectomy without radiotherapy, a complete axillary node dissection remains the standard of treatment (34).

When planning further reconstructive treatment in patients with breast cancer who had been qualified for mastectomy with axillary lymph node dissection, complications associated with primary surgical treatment must be considered. These complications include such side effects as breast cancer-related lymphedema, postoperative wound infection, seroma and paresthesias (11,35-37). Postoperative lymphedema, a condition in which fluid and protein accumulate in the extravascular interstitial spaces, is a well known risk factor for poor wound healing. In addition, axillary lymph node dissection has been shown to increase the risk of wound breakdown, infections requiring
oral antibiotics that might ultimately lead to implant loss and failure of the reconstructive procedure (11,38). Consequently to high probability of this complication some authors recommend autologous reconstruction instead of tissue expander-based reconstruction in patients who require mastectomy and axillary lymph node dissection (11). Other authors however, while discussing prolonged drain usage as an independent source of infection causing delayed healing, suggest early tissue expansion, associated with earlier drain removal as a way to avoid infectious complications (39). It has to be underlined that postoperative rehabilitation including exercises and self-massage could be a way of preventing and managing secondary lymphedema thus minimizing the risk of failure of reconstruction process due to this complication. Physicians should be able to identify this complication early and provide basic patient education on the subject (38).

Other factors

There are also some other patient-related factors that influence outcome of reconstructive breast surgery. Better short and long term reconstructive surgery results have been achieved in non-smokers vs. smokers (40), in patients younger than 45 years vs. older than 45 years (41), in non-obese vs. obese patients (40). To minimize these factors patients should be advised to maintain correct Body Mass Index and cease smoking before undergoing breast reconstruction.

Conclusions

The impact of each type of cancer treatment on breast reconstructive techniques requires further studies. Radiation therapy and axillary dissection seem to have higher inherent danger for reconstructive failure than other treatment modalities. The optimal sequence of cancer treatment and reconstructive surgery remains unclear.

Acknowledgements

None.

Footnote

Provenance: This is a Guest Perspective commissioned by the Section Editor Rong Tang (Breast Surgery, Hunan Tumor Hospital, Changsha, China; Surgical Oncology, Massachusetts General Hospital, Harvard Medical School, Boston, USA).

Conflicts of Interest: The authors have no conflicts of interest to declare.


References


35. Lucci A, McCall LM, Beitsch PD, et al. Surgical complications associated with sentinel lymph node dissection (SLND) plus axillary lymph node dissection compared with SLND alone in the American College of


Cite this article as: Szloch J, Marczyk E, Kołodziej-Rzepa M, Komorowski AL. Impact of different type of cancer treatment on the effectiveness of breast reconstruction. Gland Surg 2016;5(4):444-449. doi: 10.21037/gs.2016.05.06