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Review

Breast reconstruction with anatomical implants: A review of indications and techniques based on current literature

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HIGHLIGHTS

- Surgical treatment of breast cancer.
- Breast reconstruction with both autogenous tissue-based and implant-based.
- Complications.

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ABSTRACT

One important modality of breast cancer therapy is surgical treatment, which has become increasingly less mutilating over the last century. Breast reconstruction has become an integrated part of breast cancer treatment due to long-term psychosexual health factors and its importance for breast cancer survivors. Both autogenous tissue-based and implant-based reconstruction provides satisfactory reconstructive options due to better surgeon awareness of “the ideal breast size”, although each has its own advantages and disadvantages. An overview of the current options in breast reconstruction is presented in this article.

Contents

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1. Introduction

Breast cancer is the leading cause of cancer death among women worldwide, with approximately 1.7 million new diagnoses and 521,900 deaths occurring in 2012 [1]. One important modality of breast cancer therapy is surgical treatment, which has become increasingly less mutilating over the last century. Approximately 35–40% of women diagnosed with breast cancer undergo total mastectomy, a trend that is increasing [2]. Until the 1970s, breast cancer was treated with radical mastectomy involving removal of the breast, axillary lymph nodes, and pectoralis muscle. This was extremely disfiguring for patients and did not lend itself to optimal reconstructive options. In the 1970s, modified radical mastectomy was introduced, which preserved the pectoralis muscle and improved the contour of the chest wall, as well as increased the reconstructive possibilities. In the 1980s, a large randomized study conducted by the National Surgical Adjuvant Breast and Bowel Project (NSABP) demonstrated that breast conservation plus radiation had equivalent outcome to mastectomy [3].

Breast reconstruction has become an integrated part of breast cancer treatment due to long-term psychosexual health factors and its importance for breast cancer survivors [4–6]. Both autogenous tissue-based and implant-based reconstruction provides satisfactory reconstructive options due to better surgeon awareness of “the ideal breast size” [7], although each has its own advantages and disadvantages. Data from the United States indicate that between 1998 and 2008, there was an 11% increase in the use of implants per year, whereas autologous reconstruction rates remained stable [8,9]. Indeed, the data shows that prior to 2002, autologous reconstructions were more frequently chosen compared with prostheses. However, after 2002, this relationship was reversed, and in 2008, implants outnumbered autologous reconstructions by a ratio of 2:1 (258 vs. 120 per 1000 mastectomies) [8]. Albornoz et al. [8] suggests a number of reasons behind this change: the longer time it takes to perform autologous reconstruction, a cultural shift towards acceptance of breast implants, and the way in which reconstruction is funded. In alloplastic reconstructions, patients are exposed to less surgical risk, fewer scars, less donor site morbidity, and fewer irreversible consequences. However, surgical factors like implant type, number of surgical stages, and the use of an acellular dermal matrix can influence outcomes [10–13].

The authors analyze the current literature on the light of their multicentric experience in the filed of breast surgery in order to determine the latest trends in breast reconstruction.

2. Mastectomy: different techniques

The mastectomy procedure has evolved from the Halsted radical mastectomy, which involved a wide excision of all breast tissue, all overlying skin, and the pectoralis major muscle and included a full en bloc dissection of Level I, II, and III nodes [14]. The most commonly performed mastectomy is the total mastectomy, which removes all breast tissue including the nipple–areola complex (NAC) and an ellipse of skin adjacent to the nipple–areola complex.

For women who require mastectomy for the surgical management of breast cancer or as a prophylactic procedure in those with a known genetic predisposition for breast cancer, skin-sparing mastectomy with immediate reconstruction is an excellent choice that allows complete breast parenchyma resection with acceptable breast mound provision via an implant or flap. This procedure preserves as much of the patient's breast skin as possible—the breast parenchyma and nipple–areola complex are removed through a circumareolar incision (sentinel lymph node dissection may be performed through a separate incision if indicated). Skin-sparing mastectomy has been shown to have equivalent local recurrence rates to conventional mastectomy given the selection bias of reserving this approach for patients without clinical evidence of locally advanced or inflammatory breast cancer [15–18].

Another surgical option is nipple-sparing mastectomy, which involves a total mastectomy via a noncentral incision (such as an inframammary or axillary approach), preserving the skin, skin envelope, and cutaneous portion of the nipple–areola complex. Crowe et al. published one of the first modern series on this technique, reporting the technical feasibility of nipple-sparing mastectomy [19] (Figs. 1–3).

3. Implants

Use of prosthetic implants for breast reconstruction began in the early 1960s when Cronin and Gerow developed the silicone prosthesis and used it clinically for augmentation mammoplasty [20]. Shortly thereafter, these implants began to be used for the reconstruction of mastectomized breasts [21]. Breast reconstructions using prosthetic implants were applied in a single stage at first. Development of tissue expanders by Radovan created new possibilities in immediate or delayed reconstruction, and the popularity of single-stage reconstruction by implants was overtaken by two-stage reconstructions during the 1980s [22].

The use of implants and skin expanders are the quickest and presumably easiest methods of breast reconstruction. The prerequisite for implant-based breast reconstruction is an adequate skin envelope to cover the implant that is usually introduced into the submuscular plane by detaching the medial insertions of the pectoralis major muscle from the ribs. Saline and silicone gel implants are available as the final implant material for expander/implant-based postmastectomy reconstruction. All implant models have a bladder (or outside shell) made of solid silicone. The shell can be either textured or smooth. Modern expanders are textured to help