

# Alloplastic breast reconstruction after mastectomy

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## Summary

The aim of reconstruction with expanders is to restore breast shape and volume as close as possible to the contralateral breast and to reconstruct the inframammary fold with adequate ptosis.

*Key words:* Breast cancer; Mastectomy; Alloplastic reconstruction

## Introduction

The reconstruction of the female breast after mastectomy is nowadays an integral part of the surgical treatment of breast cancer [1, 2]. If it is necessary for oncologic reasons and if there are contraindications for breast conserving therapy, methods of breast reconstruction can contribute significantly to the restoration of physical integrity, including an improvement of life quality of the affected women. Besides an improvement or restoration of the physical image and of self-esteem, breast reconstruction leads to a processing of an oncologically necessary mastectomy from a psycho- oncological and rehabilitative point of view [3].

## Development of expander and implant technology

The era of modern breast reconstruction began in the early 1960s with the introduction of silicone-filled implants. Implants of the former generation have a round shape and a smooth surface. Smooth implants tend to have an increased rate of intense capsular contractions, dislocations, and therefore often a poor, asymmetric overall result with a frequent need of corrective surgery such as capsulotomy, capsulectomy, change of implant, explantation surgery, and autologous conversion. Furthermore, implants with a round shape are suitable only for a small breast up to 300 grams without contralateral ptosis and little projection, a type of breast that is found to be mainly in Asia [4, 5].

Implants of the new generation which are currently in use reflect the developments of implant technology of the last years and lead, provided that the medical indications are respected, to very good symmetric reconstructions with long-term stability of the results. By texturing the surface of the implant, the rate of capsular contractions and the need for corrective surgery decline significantly.

If surfacing the implant with polyurethane leads to the same long-term results cannot yet be ultimately judged. In conditions of thin soft tissue, the combining of polyurethane surfacing and surrounding tissue can cause surgical difficulties in case of a necessary change of implants or it can be a contraindication for reimplantation. The filling of the implants with cohesive silicone gel in combination with an enforced coat of the implant lead to significantly higher safety of the implants. Because of their fluid consistency and instability of their form, implants with sodium chloride filling can only be recommended limitedly with regards to the overall aesthetic result. The decisive progress in alloplastic breast reconstruction is based on the development and introduction of anatomically shaped implants. This shape of implants facilitates the reconstruction of a natural, symmetrical breast as it is found in Europe and America [6, 7].

In the 1970s Radovan introduced the expander technology in breast reconstruction [8]. Various progresses in design and technology of expanders lead to more consistent and better results in expansion and therefore make alloplastic breast reconstruction more predictable and safer [9]. Texturing of the surface of the expanders simplifies the process of expansion, leads to less capsular contractions (especially in combination with textured implants), dislocation, and deformation of the chest wall. The introduction of anatomically shaped expanders enables the expansion of the lower breast pole, which is preferred in most cases, in order to prepare a symmetrical reconstruction. By integrating a valve directly in to the expander the placement of a distant port for filling is unnecessary and increases the comfort for patients and doctors during the expansion phase.

According to the present authors' experience, the best results of alloplastic breast reconstruction are achieved by the use of anatomically shaped, textured implants filled

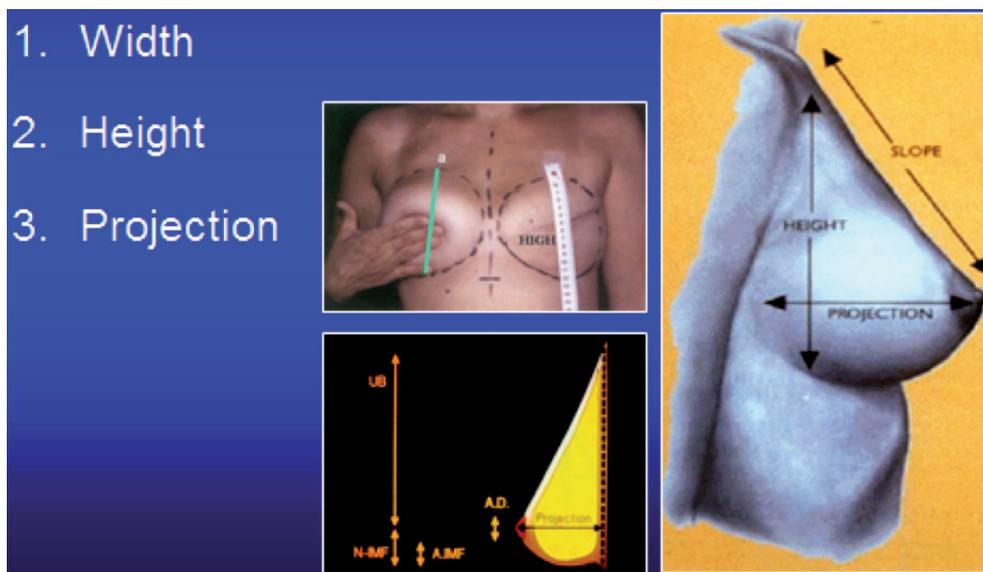


Figure 1. — Parameters of alloplastic reconstruction.

with cohesive gel and, in case of need of tissue expansion, in combination with anatomically shaped, textured expanders (Figure 1) [2, 10].

### Basics of alloplastic breast reconstruction

In order to achieve optimal cosmetic results of alloplastic breast reconstruction, the following anatomic conditions need to be respected [11, 12]: 1) conservation of the inframammary crease, 2) integrity of the major pectoral muscle, and 3) quality and tautness of the skin

The conservation of the inframammary crease during mastectomy is safe from an oncologic point of view, as only very rarely is breast parenchyma found distally to the inframammary crease. The latter is formed by fusion of the superficial and mammary fascia. Its contour is defined by the distribution of fine fibrous retinaculae which connect the dermal as well as the musculofascial layers to a superficial fascia. The mammary fascia represents the natural cover of the mammary gland. The loss of this structural network at the time of mastectomy will lead to an inferior cosmetic result.

Small lesions of the major pectoral muscle present no problem for an alloplastic breast reconstruction. However, larger dehiscences within the muscle should be provided with absorbable sutures. Alloplastic breast reconstruction is planned geometrically according to three parameters: width of the breast (basis of the breast), height of the breast, and projection. The width and the height are defined by the measurements of the contralateral breast. They are then plotted on the side of the chest wall that is to be reconstructed precisely to where the planned localisation of the expander is. The projection of the breast can to some extent be predicted by the dimensions of the expander. De-

pending on the final volume, a permanent anatomic implant with corresponding width, height, and projection can be chosen [13].

### Indications for alloplastic breast reconstruction

Because of a higher overall complication rate in primary expander-implant reconstruction, secondary expander-implant reconstruction should be preferred if alloplastic reconstruction is indicated. For reconstruction of a smaller, non-ptotic breast after mastectomy without radiation of the chest wall, secondary expander-implant reconstruction is suitable to achieve a good cosmetic result, provided that a subtle planning and surgical technique is considered [14-16].

Secondary combined expander-implant reconstruction is currently the most commonly used method of reconstruction of the female breast after mastectomy. If performed with the most modern expander and implant technologies, this method has various advantages [17]: 1) it is a relatively simple and safe surgical technique which is easy to be taught, understood, and standardized, and thus also suitable for less highly specialized centres; 2) only tissue of identical texture, colour, and sensitivity is used for breast reconstruction; 3) as compared to autologous reconstruction with distant flaps, there is no morbidity in the area of extraction; 4) only a small incision with consequently little scarring is necessary; 5) the operation time is significantly reduced as compared to autologous reconstruction. The time of postoperative reconvalence is short.

Generally speaking, a small, not ptotic contralateral breast is suitable for alloplastic breast reconstruction after mastectomy. Patients need to be informed that in order to adjust symmetry or shape, mastopexy or reductive

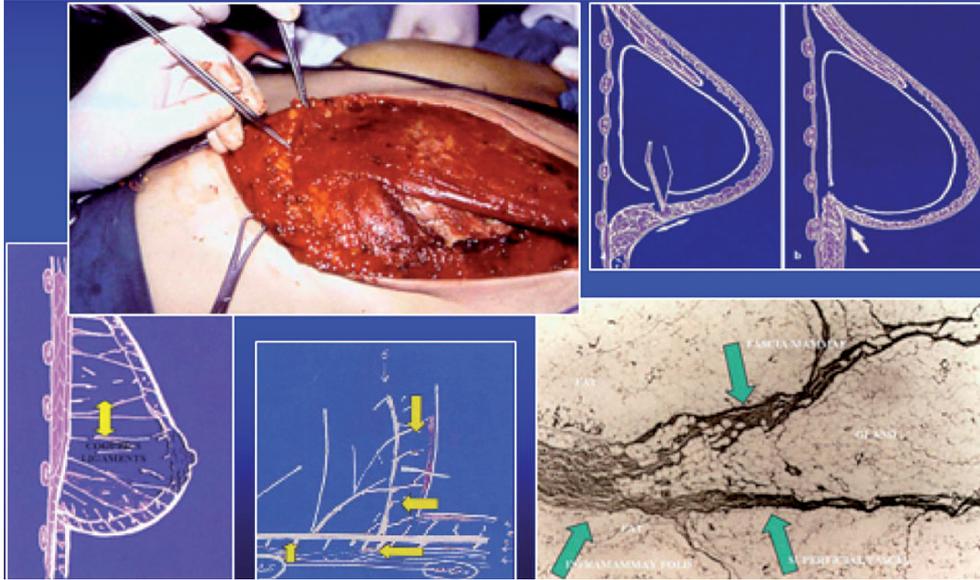


Figure 2. — Principle of reconstruction of the inframammary fold.

mastopexy might be necessary. The risk of a secondary, adapting reduction mastopexy increases with size and ptosis of the contralateral breast.

Macromasty and extreme ptosis of the contralateral breast are relative contraindications for a reconstruction with expander implant. The most important relative contraindication, however, is radiotherapy of the chest wall [18-21]. Since the indication for radiation of the chest wall has been extended in the last years, and primarily depends on histopathologic parameters (tumour size, lymphangiosis, lymph node metastases), the indication for primary reconstruction with implant or expander implant has to be very restricted and well-considered. After radiation therapy, fibrosis and interactions with the blood circulation of the skin increase the rate of complications in alloplastic reconstructions, such as capsular contractures, necrosis or deficient aesthetic results. The eschewal of expander reconstruction is very often possible in skin-sparing mastectomy (SSM). Especially in cases of extended ductal carcinoma in situ, SSM is an increasingly common surgical alternative to modified radical mastectomy [22].

It is very important to thoroughly inform patients about general methods of breast reconstruction. It is necessary to inform about advantages and disadvantages of alloplastic reconstruction as compared to autologous reconstruction, including microsurgical techniques (deep inferior epigastric perforator = DIEP flaps). When indicating alloplastic reconstruction, the wish of the patient to be intensely informed needs to be respected. Former surgery, age, and comorbidity of the patients, previous or postoperative radiation therapy, size of the breast, shape of the breast, symmetry, the personal experience of the surgeon and, last but not least, the wish of the patients are essential parameters when choosing the optimal method of breast

reconstruction [1, 23].

When planning the surgical procedure, the incision line and the amount of skin that needs to be removed have to be considered from an oncological as well as from a plastic-reconstructive point of view, already at the time of mastectomy. The dimension of the contralateral breast, especially the basis of the breast, defines the size of the expander. The preoperative marking of the subpectoral expander-implant loge is performed on the chest wall and can be supported by so-called “templates”. The lower line of the loge should not be more than one cm below the inframammary crease. The submuscular, in the caudolateral area subcutaneous loge, should have the same extent as the chosen expander and should correspond to the basis and height of the contralateral breast. During the preparation of the submuscular loge, a consistent dissection is performed visually in cranial, caudal, and medial direction. The caudal and medial insertions of the major pectoral muscle are cut through visually, coming from the subpectoral direction (Figure 2). The expander loge in the caudolateral area of the chest wall lies subcutaneously. This is especially important for secondary expander implant reconstruction. When implanted in the loge, the expander is filled to 50% with a sodium chloride solution. Afterwards, the wound is closed layer by layer. The closing of the major pectoral muscle is especially important in order to achieve a sufficient coverage of the expander with soft tissue (Figure 3). Further expansion begins at one week after implantation in three-day intervals, in steps of 50ml to 100 ml. Rapid expansion is necessary to avoid early development of a capsula. The filling volume should be at least 70-80% of the possible expander volume. After another three to six months, the expander can be replaced by a suitably planned and chosen implant. Form



Figure 3. — Postoperative result of secondary two stage reconstruction.

and size of the chosen implant determine the quality of the result of the reconstruction. The implant logo can be optimized by targeted capsulotomy. If the inframammary crease is too high, it can be lowered by caudal capsulotomy. If the inframammary crease is too low, it can be reshaped and relocated by caudal capsulotomy, ellipsoid capsulectomy, and adaptation of the anterior to the posterior capsula with non-resorbable sutures. After insertion of a drain, the final anatomic implant is positioned and the wound is closed in multiple layers. The positioning of the implant over the first two postoperative weeks is ensured by a special tape bandage [24, 25].

### Complications

The incidence of local complications is lower in primary implant and secondary expander implant reconstruction than in autologous secondary reconstructions, if the medical indications are respected [26, 27]. Early complications include haematoma, necrosis of the skin, infections, and pain. Adjuvant treatments including chemotherapy and radiation therapy can cause delayed wound healing. Delayed complications are infection, implant extrusion, and capsular contracture. Generally speaking, complications are more common after immediate reconstruction than after secondary reconstruction. This can be explained by the application of adjuvant therapies at the time of immediate reconstruction. Chemotherapy affects the immune system, and therefore influences processes of regeneration and wound healing. Radiation therapy deteriorates the capacity

of skin stretching and leads to excessive fibrosis. Furthermore, it reduces oxygenation of the tissue, which leads to excessive capsular reactions. Persistent infections often lead to removal of the implants. In this case, further reconstructive procedures can only be performed after the final healing of the infections [28].

### Conclusions

Alloplastic methods of breast reconstruction are the most common methods of reconstructing the female breast after mastectomy. In order to obtain optimal results from reconstruction, the use of textured, anatomically shaped expander implant systems are recommended. After modified radical mastectomy, a combined expander implant reconstruction can be indicated to reconstruct a smaller, non-ptotic breast after performing stretching of the skin. This combined expander implant reconstruction can be performed primarily during mastectomy as well as secondarily. If adjuvant therapy is necessary, especially in the case of radiation therapy, an implant or expander implant reconstruction is relatively contraindicated because of an insufficiently high rate of complication. The patients need to be informed about the very often necessity of adapting mastopexy or reduction mastopexy of the contralateral breast and about possible autologous methods of reconstruction. In the present authors' opinion, adjuvant radiation therapy is a contraindication for alloplastic reconstruction because of an unacceptable complication rate, especially if compared to autologous reconstruction. Therefore, primary alloplastic reconstruction should be indicated very critically. When planning alloplastic or, of course, autologous breast reconstruction, the overall oncological situation of the patient needs to be considered. To avoid prognostic or aesthetic disadvantages, the differential indication for the methods of breast reconstruction should ideally take place in specialized breast centres with experience in all methods of reconstruction.

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