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Essential elements of the preoperative breast reconstruction evaluation

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Abstract: A plethora of options exist for breast reconstruction and preoperative evaluation must be thorough to lead to a successful outcome. We review multiple components of the preoperative assessment including the patient's history, goals, imaging, and key elements of the physical exam. Consideration for tumor biology, staging, need or response to chemotherapy or radiation therapy is important in deciding on immediate versus delayed reconstruction. It is also important to consider the patient's anatomy, breast size and whether the reconstruction will be unilateral or bilateral. The reconstructive surgeon must accommodate all these factors to consider partial or complete mastectomy defects and guide the patient to the most appropriate reconstructive technique whether it be an oncoplastic reduction mammoplasty, expander-based reconstruction, immediate implant reconstruction, or immediate versus delayed autologous tissue reconstruction such as the deep inferior epigastric artery perforator (DIEP)/transverse rectus abdominis muscle (TRAM), latissimus, transverse upper gracilis (TUG)/profunda femoris artery perforator (PAP), or gluteal artery perforator (GAP) flaps.

Keywords: Breast reconstruction; consultation; risk factors; breast cancer; screening; motivations

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Introduction

Pre-operative planning for breast reconstruction patients is one of the most important aspects of the process and is often overlooked. Appropriate alignment of the patient's desires and the surgeon's abilities is critical to ensure realistic expectations and will contribute significantly to the patients overall satisfaction with the process, their surgeon and their final aesthetic result. We will discuss these factors based on our personal experience as well as highlight current literature regarding breast reconstruction.

Preoperative consultation

A proper initial consultation for breast reconstruction is obviously important in the road to a successful reconstruction process. This is often not a quick process and not only involves understanding the patient's medical

history and doing a physical examination, but also involves getting to know the patient from a personal and psychological perspective. A thorough evaluation of multiple factors in the patient's medical history, physical examination, consideration of psychosocial factors and imaging is necessary to select the appropriate reconstructive technique. Level of education and socio-economic status may be useful as predictors of compliance and ability to successfully complete the reconstructive process. It is important to have an idea of the driving forces and motivations behind why patients are here discussing breast reconstruction (1). If the patient is only in the office because she was sent by her breast surgeon, or her significant other is forcing her to be there, then perhaps a more educational approach should be taken to allow the patient to make her own decision.

Most patients have been referred from an oncologic surgeon with a known diagnosis and a definitive plan for

surgery and/or adjuvant therapy. It is important to review the pathological diagnosis to understand the tumor biology beyond simple benign versus malignant potential. Ductal carcinoma *in situ* behaves differently from lobular carcinoma *in situ* in contralateral risk. Some “benign” tumors (i.e., Phyllodes) have a high likelihood of locoregional recurrence and reconstruction may be best delayed. The plastic surgeon must consider the possible need for additional surgery (axillary lymph node dissection) and/or chemotherapy or radiation therapy. Patients with diffuse disease or large aggressive tumors (triple negative) may have positive margins despite mastectomy and need postoperative radiation. Lobular carcinoma and patients with BRCA mutation may benefit from bilateral mastectomy. Many surgeons prefer to delay reconstruction if postoperative radiation therapy is definitely indicated. Autologous reconstructions for example are often deferred until completion of radiation therapy and the decision on whether an expander or temporary reconstruction will be performed depends on the surgeon’s preferences, patient’s desires and also breast size/shape. If the patient has already had radiation therapy then this also directly impacts the decision process since prosthetic based reconstructions might be less preferable due to a higher complication rate (2). The reconstructive surgeon must consider individual tumor biology and staging prior to recommending reconstructive options.

A thorough review of the patient’s co-morbidities is crucial to understanding the possible risks of surgery and complications. A history of tobacco use is another important aspect of the preoperative evaluation that needs to be addressed. While smoking is not an absolute contraindication, the rate of mastectomy flap necrosis increases significantly in active smokers. Active heavy smokers with compromised vascularity of the mastectomy flap(s) may benefit from delayed reconstruction. The importance of preoperative smoking cessation is critical and even with being off cigarettes for at least a month prior to the procedure, there are certain procedures that would be less desirable in patients even with a remote history of smoking (3-5). Coagulopathy screening may be indicated in patients with significant family history or a personal history of embolic disease, deep venous thrombosis (DVT), and/or spontaneous abortions. Obesity alone is associated with higher complication rates including wound, medical, infection, major surgical, graft and prosthesis loss, and return to the operating room (6). Older age, smoking, obesity and BMI contribute to delayed wound healing in patients undergoing free tissue reconstruction (7). Patients with multiple co-morbidities are at higher risk for

complications associated with increased length of surgery associated with complex autologous reconstruction. While it is often not feasible to have patients lose weight prior to the procedure if immediate reconstruction is planned, it is important to discuss the risk of potential complications with the patient and if deemed to be risky, delay reconstruction to allow for weight loss.

Physical exam

Examination of the patient’s breast size, shape and body habitus is obviously one of the more important parts of the preoperative evaluation. The surgeon needs to determine what they are trying to match if it is a unilateral reconstruction and what options the patient has for autologous reconstruction. The current breast size and desired postoperative breast size must be noted with equal importance. Patients may not have initially considered contralateral procedure for symmetry via mastopexy, augmentation, or reduction, however, this is important since it is often not possible to match a significantly ptotic, large or even small breast. Adjusting the opposite breast will often improve the ability to provide symmetry and needs to be discussed with the patient. It is important that the surgeon guide the patient in terms of breast size. Laterality is also important in determining the most appropriate reconstructive procedure. Some patients may adamantly refuse procedures on the contralateral breast and therefore the goal will be to match the native breast, and realistic expectations need to be presented. In patients with macromastia, reconstruction is often not possible without significant reduction on both sides. Patients desiring reduction in size and have smaller tumors may be amenable to oncoplastic approach (8). Most commonly patients desire matching breast size and therefore selection of implant versus tissue will depend on the volume of tissue available. Patient should be counseled that contralateral symmetry procedures are performed either simultaneously or in a delayed fashion (9).

During the examination attention should be focused on the patient’s breasts to note overall size and shape, location and size of masses in the breast/axilla, the position of the inframammary fold and nipple (grade of ptosis), nipple deformity (i.e., inversion), location of the biopsy scar, any chest wall deformity (i.e., pectus), skin changes (peau d’orange or radiation fibrosis) and any asymmetries. Measurements of the sternum to nipple, nipple to fold, and base diameter are taken to aid in selection of implants.

For patients considering autologous tissue reconstruction,

Table 1 Proposed checklist in pre-operative evaluation

The workup	
Tumor stage, size, type , ER/PR/Her2neu	
Surgical plan or history (lumpectomy vs. mastectomy, immediate vs. delayed)	
Chemotherapy or radiation therapy plan or history	
Current size, desired size	
Family history (breast disease and coagulopathy)	
Contralateral breast imaging/pathology	
Prior surgical history (donor site)	
Smoking	
Patient expectations/goals and compliance	
Comorbid conditions (HTN, DM, CAD, obesity, hypercoagulable disorders)	
Examination	
BMI	
Size and location of tumor or mastectomy defect	
Breast size (base diameter, volume, shape), ptosis	
Skin quality (radiation changes, scar)	
Nipple areolar position (ptosis)	
Contralateral breast (size, shape, projection, ptosis)	
Donor site (abdomen, back, thighs, buttocks)	
Imaging	
Mammogram	
Ultrasound	
MRI breast	
PET scan	
CT angiography	
MR angiography	

the possible donor sites with adequate volume must be thoroughly examined. The abdomen is commonly used and should be noted for any previous surgical scars which may have damaged the vascularity or caused hernias. The Pfannenstiel scar is commonly encountered nowadays following Caesarian sections or hysterectomy but does not necessarily preclude the use of the abdominal tissue (10). Patients with subcostal scars are at slightly higher risk for abdominal wound healing complications (11). Approaches can be modified in such patients to minimize donor and flap morbidity utilizing preoperative imaging (12). While the back may lack adequate volume in a thinner patient, it may be ideal in obese patients with ample tissue (13). Alternatively if the abdominal donor site and back are not suitable, the inner thigh region can be considered for a transverse upper gracilis

(TUG) flap (14) or profunda femoris artery perforator (PAP) flap (15). Also, the gluteal region is available in women using the superior or inferior gluteal artery perforator (SGAP/IGAP) flap (16). Some women may find these specific donor sites less culturally acceptable.

Pre-operative imaging

Any concern for disease in the contralateral breast requires complete evaluation with imaging and or biopsy prior to intervention to avoid missing any pathology. A review of preoperative imaging such as mammogram, ultrasound and MRI studies is useful to understanding tumor size and location. Additional preoperative imaging may be ordered by the reconstructive surgeon in mapping perforator anatomy to expedite surgery (17,18). Both CT angiography (CTA) and MR angiography require specific protocols for obtaining useful mapping of the perforator location (19,20). Preoperative CTA prior to deep inferior epigastric artery perforator (DIEP) flaps demonstrate good correlation between perforator locations to reduce operative time. However, clinical judgment at the time of dissection is still important in final perforator selection and successful flap harvest since the imaging may be inadequate. Keys *et al.* noted only 62 or 76 planned perforators were ultimately selected, with 23/52 flaps involving intraoperative changes based on clinical findings not apparent on preoperative imaging (21). For patients with prior extensive abdominal surgery, preoperative imaging can confirm the viability of perforators for abdominal based flaps. Preoperative imaging can also improve the chances of successful DIEP versus transverse rectus abdominis muscle (TRAM) flap harvest and decrease partial flap failure (22). The disadvantages include increased preoperative costs, radiation exposure, risk of contrast nephropathy, and a small risk of incidental findings requiring additional intervention. Nonetheless, several studies demonstrate reduced surgeon stress, decreased donor and recipient site complications, and improved operative time (23). Ultimately, the surgeon must use his/her best judgment in utilizing preoperative imaging appropriately to facilitate perforator flap breast reconstruction.

Conclusions

Preoperative evaluation of breast reconstruction is a complex process involving multiple components (*Table 1*). A successful relationship should be established after thorough

evaluation of each individual patient history, imaging, physical exam, goals, and discussion of options to decide on the optimal reconstructive technique.

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