Breast Augmentation

by Marissa M.J. Tenenbaum, MD & Terence M. Myckatyn, MD

Breast augmentation is a safe procedure that has remained very popular among American women. Careful patient selection and thoughtful perioperative planning enables aesthetic breast augmentation.

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Introduction

According to the American Society of Plastic Surgeons website, over a quarter of a million breast augmentations were performed in 2004. This was a 24% increase over the number performed in 2000, making breast augmentation the second most frequent cosmetic surgical procedure performed on women and third most common overall. After the FDA placed a moratorium on the use of silicone implants in 1992, interest in breast augmentation rapidly declined secondary to fears associated with autoimmune disorders. However, interest in breast augmentation has steadily risen over the last decade. This is likely in part due to new implants, new procedures and the recent explosion of media coverage of cosmetic procedures. This coupled

with a desire of American women to keep pace with an evolving standard of beauty likely means that breast augmentation will continue to be among the most often performed cosmetic procedures.

Preoperative Evaluation

Any patient presenting for a breast augmentation should first be evaluated as any other surgical patient would be. A thorough history and physical exam are essential. Patients interested in breast augmentation tend to be younger and healthier than a typical surgical patient. Any health problems much be adequately addressed before undergoing general anesthesia. Age, medical, psychiatric and surgical history, personal or family history of breast disease with a particular emphasis on preoperative mammography must be evaluated and are essential information.

Evaluation specific to the requested procedure is also done. A thorough understanding of the patient's goals is imperative. Some surgeons ask that patients review photographs of other women who have had breast augmentation to determine their desired endpoint in regard to size, shape and position. Other surgeons may ask for a desired cup size. Whatever the surgeon's particular preference for determining goals, this communication is of utmost importance when planning for surgery.

A thorough physical exam is essential to successful breast augmentation. An evaluation should consist of an overall evaluation of the patient's figure in regard to proportion and height. A breast exam should note skin thickness and elasticity, breast parenchyma attributes such as amount, density, degree of ptosis, asymmetry, nipple position and symmetry, base width and location of the inframammary fold (IMF). Measurements are also taken and include chest circumference, base width, nipple-IMF distance, sternal notch to nipple distance and a pinch test which gives an estimate of skin thickness. These are an objective method to quantify size, position and asymmetries.

After an assessment has been made, there are multiple decisions that the surgeon will make. These decisions are based on safety, patient preference as well as surgeon expertise/preference. They include the approach or incision location, the plane of implant placement and the implant style.

Surgical Approaches

There are four basic approaches that will be discussed, inframammary fold, periareolar, transaxillary and transumbilical (Figure 1). Each technique has associated risks and benefits and the decision is based on patient characteristics and desires and surgeon preference.

An inframammary fold (IMF) incision (Figure 1A) is very versatile and offers excellent exposure regardless of implant type or plane of placement. It is best used in patients with an appropriate base width and slight ptosis so that the scar is hidden in a deep crease below the breast. In patients that need adjustment of the IMF position, incision placement can be precarious and needs to be carefully planned to lie at or just above the fold. Many patients fear that the scar will be most visible with this approach. When using a saline implant the incision can be as small as 2-3 cm and is usually well hidden.

A periareolar incision is also very popular (Figure 1B). Some plastic surgeons feel that this is the most versatile approach. It offers excellent exposure regardless of implant type or plane of placement and is the best choice when lowering of the IMF is necessary or when a concurrent mastopexy is indicated[1,2]. If a patient has a very small areola, exposure
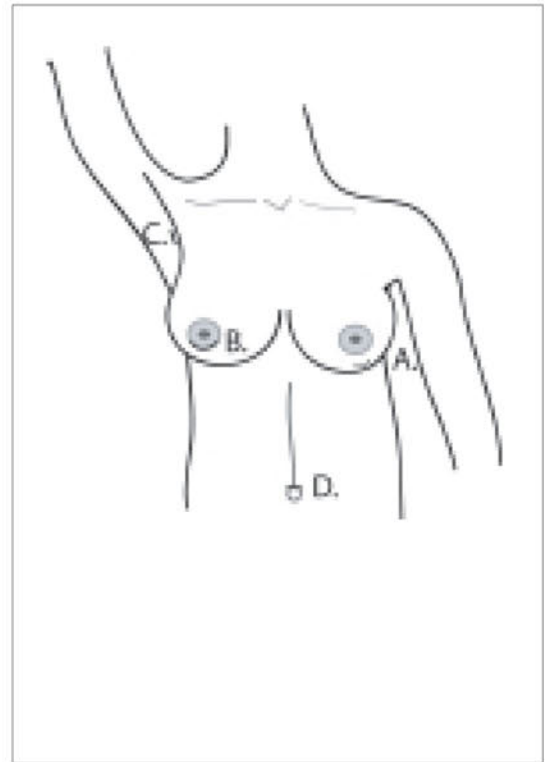
is compromised making this an inferior choice. The scar is visible on the breast mound. If the patient has a very light areola or a propensity for hypertrophic scaring this is not a wise choice. However, in many patients, after the scar matures it is well concealed along the edge of the areola. There has been some evidence to suggest that future lactation may be compromised, or that infection risks are slightly higher with this approach, so patients should be counseled about this preoperatively.

An axillary incision (Figure 1C) is ideal in patients with a breast that is positioned very high on the chest wall and does not need any movement of her IMF. It is an attractive choice in that the scar is hidden in the axilla and is often of very good quality. It does not necessitate endoscopy but placement can be aided with this technique. It has been reported that the procedure is more precise when endoscopy is utilized[3]. Patients should be informed that due to the disruption in the axillary plane, a future sentinel lymph node biopsy is not possible should they ever need one and instead a formal axillary

dissection would be required.

The trans-umbilical endoscopic approach (Figure 1D) is actually a bit controversial among plastic surgeons. The obvious advantage is a tiny scar hidden in the patient's umbilicus. The obvious disadvantage is less exposure, less control over bleeding and position of the implant. This approach is best suited for a patient who does not require movement of the IMF, desires no scar on the breast or in the axilla and is receiving a saline implant since a silicone implant will not pass through the endoscopic tunnel. It can be utilized in subglandular or submuscular planes, although many authors feel that that submuscular plane is significantly more difficult and prone to implant malpositioning. While there are many surgeons who feel that it is an inferior approach there are some that feel with proper training it is a useful tool in the armamentarium of breast augmentation surgeons[4]. This approach is likely going to remain popular due to the limited scarring and has certainly been shown to be safe and effective in a well selected patient population.

Plane of Implant Placement

There are three planes of implant placement that will be discussed. Subglandular, submuscular and dual-plane (Figure 2). The most logical choice and the oldest method is a subglandular plane (Figure 2A). This is where the implant is placed directly below the breast parenchyma above the pectoralis muscle.
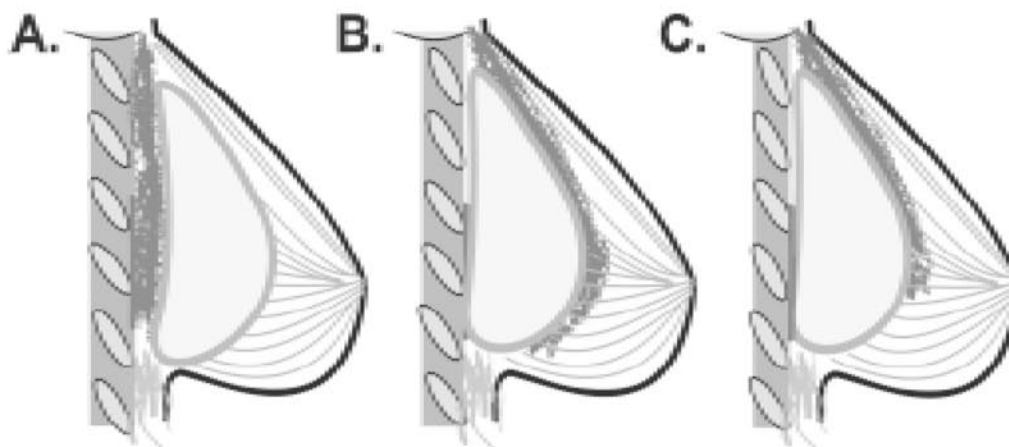

Figure 2: Diagram of plane of implant placement.
A. Subglandular placement in which the implant is placed directly beneath breast parenchyma and above pectoralis major muscle.
B. Submuscular placement in which the implant is placed below the pectoralis major muscle.
C. Dual-plane placement in which the implant is placed beneath the pectoralis major muscle superiorly and beneath the breast parenchyma inferiorly.

This technique works best when the patient has ample soft tissue to cover the implant. An ideal candidate is one with a large breast volume, glandular ptosis and ample skin laxity as may be seen in many postpartum patients. In thin patients, the implant may be visible underneath the skin and is not recommended if the superior pole skin pinch thickness is less than two cm. There is also extensive evidence to show that subglandular placement places the patient at much higher risk for capsular contracture, a complication that will be discussed later[5]. The subglandular plane is also inferior to the submuscular plane in regard to interference with mammography[6,7].

Submuscular implant placement has the advantage of decreased capsular contracture as well as decreased implant visibility. Total muscle coverage consists of placing the implant below the pectoralis major muscle as well as the serratus anterior muscle and the anterior rectus sheath. This was initially done to decrease visibility, palpability and capsular contracture. This had the drawback of inferior lower pole shape and long tern superior migration of the implant. Currently, this plane is usually

reserved for breast reconstruction after mastectomy. When submuscular placement is discussed, this generally refers to placement under the pectoralis muscle superiorly but in the lower portion of the breast the implant is subglandular and is referred to as partial submuscular. Advantages of this technique include a decreased rate of capsular contracture, less superior implant visibility and rippling and improved accuracy of mammography. However, the trade-off is distortion of the breast with contraction of the pectoralis muscle as well as less control over final breast shape.

Dual plane augmentation is a modification of submuscular placement. According to Tebbetts, it combines the benefits of decreased capsular contracture and decreased superior implant visibility with greater control over the implant-soft tissue relationship, especially in the lower pole. He states that a dual plane augmentation is one in which the implant simultaneously lies in two planes, partially behind the pectoralis muscle and partially behind the breast parenchyma. The key difference between a dual plane and a partial submuscular implant is that a subset of pectoralis major origins

are totally divided to alter the implant-soft tissue dynamic[8]. The muscle fiber origins along the IMF are divided and a subglandular dissection is performed to allow the muscle to sit in a more superior location and the implant to lie partially behind the muscle and partially behind the parenchyma. The only trade-off appears to be the potential for increased palpability of the implant inferiorly.

Implant Style: Saline vs. Silicone Gel

There are several implant variables. They include filler material, size or volume, shape, and surface or shell texture. Currently, the filler material in the U.S. is predominantly saline. Although saline lacks the natural feel that silicone offers as well as the problem of visible rippling, they have been shown to decrease the rate of capsular contractures. As mentioned earlier, the FDA placed a moratorium on the use of silicone implants in 1992. Since that time, silicone has only been used in breast reconstruction, replacement of prior silicone implant and for saline implant failure. All women were required to enroll in a FDA-sponsored clinical trial. Extensive research over the last decade has failed to show a link between silicone breast implants and any systemic illness including rheumatic diseases and cancer[9-11].

The controversies of the last decade have forced corporations to develop better and safer breast implants. The new silicone implants contain a more cohesive, form-stable gel that is much less prone to bleed. They have been successfully in use in Europe for several years[12]. In April of 2005, an FDA advisory panel recommended that the FDA grant Mentor a PMA for a new silicone implant. It appears that these new silicone breast implants will gain widespread popularity once again. They will continue to be tracked in long term FDA-sponsored clinical trials.

All implants have either a smooth or textured shell. There has been evidence to support decreased capsular contracture with textured implants[13]. However, in thin patients receiving saline implants, rippling is more of a problem with a textured shell[14]. Many surgeons will place a textured saline implant in a patient with a greater preoperative breast volume and a smooth implant in the thinner, smaller breasted patient.

Most implants placed in American women are round. Conceptually, it makes sense that a "shaped" implant would offer a more natural shape. These implants are designed in a teardrop fashion to create a flatter superior pole and a more anatomically correct breast. Most surgeons would agree that with proper selection of size and fill volume, a natural, flat superior pole can be achieved with a round implant. A shaped implant also has the potential complication of rotation causing deformity and asymmetry.

Selecting the proper size and fill volume is imperative to a natural looking breast. The decision should be made by the surgeon and the patient after breast measurements and tissue characteristics are analyzed and patient desires are understood. Tebbetts has created a system of estimating size of the implant and fill volume based on three simple measurements[15]. The breast width is used to determine the amount of tissue coverage available for the implant. This is used to select the initial implant size since the base width correlates with a starting volume. The anterior skin stretch gives an estimation of how much the skin envelope will stretch once the implant is filled with saline. If the stretch is less than two cm, 30 cc is subtracted from the initial volume, if it is greater than three cm, 30 cc is added and if it is greater than four cm, 60 cc is added. If the nipple-IMF distance is greater than 9.5 cm, an additional 30 cc is added to the final volume. The last measurement taken is the parenchyma to stretched envelope fill which is an estimation of the contribution of the patient's existing breast volume to final volume. If this is less than 20%, an additional 30 cc is added to the final volume and if it is greater than 80%, 30 cc is subtracted from the final volume. The final consideration is patient request. All of these factors give a good estimation of final volume. As all saline implants can be overfilled by a certain amount, an implant size is chosen and is filled to the preselected volume. Intraoperative adjustments can be made based on appearance.

Complications

The complications of breast augmentation can be divided between surgical complications and implant complications. Surgical complications include hematoma, seroma, wound infection, decreased sensation and pain. Hematoma is a significant problem and should be surgically evacuated as soon as it is discovered. Large hematomas are associated with higher rates of wound infection [16] and capsular contracture [17]. Seromas are usually reabsorbed in a matter of days. A refractory or particularly painful seroma may need to be aspirated or in extreme cases, surgically drained. As with any surgical procedure, there is a risk of wound infection. When a foreign body is present wound infections are particularly concerning. Early aggressive treatment with systemic antibiotics is necessary to prevent infection of the implant or implant pocket necessitating implant removal. Decreased nipple sensation occurs in a small number of patients and they should be counseled about its possibility preoperatively. In order to avoid altered nipple sensation one must preserve the anterior branches of the fourth, fifth and sixth intercostal nerves on the lateral aspect of the breast. It is easier to avoid these branches in a submuscular plane than in a subglandular plane. Postoperative pain is to be expected and is greatest with complete submuscular implants. With certain techniques,

authors report a quick return to daily activities[18, 19].

Implant complications include capsular contracture, displacement, audible "sloshing" with saline-filled implants, rippling, rupture and interference with breast cancer detection. Capsular contracture refers to a hard fibrous capsule that may form around a breast implant leading to firmness of the breast and depending on severity, pain and anatomic distortion. There are several theories on the cause of capsular contracture but an accepted theory has yet to be established. In 1975, Baker devised a classification scheme to grade the severity of capsular contracture[20]. The classification ranks contracture from grades I-IV, no palpable capsule to severe contracture. As stated previously, the rate of capsular contracture is elevated with the use of silicone implants, however the new cohesive gel implants may fare better. Capsular contracture is also elevated when implants are placed subglandularly and when the shell is smooth. Therefore, to decrease the chance of a contracture a textured implant is the best choice if subglandular placement is desired. If submuscular placement is desired, then a smooth implant is sufficient.

Many surgeons advocate postoperative massage of the breasts to prevent formation of a tight capsule around the implant. The theory is that if the implant is moved through a range of space, then the capsule that forms will be larger than the implant decreasing the chance of a visible or painful capsule. Once a capsule has become a problem, closed capsulectomy or open capsulectomy with or without implant exchange should be accomplished. Closed capsulectomy is a method of hydraulically rupturing the capsule. Unfortunately, it is often unsuccessful, and can cause implant rupture or a worse deformity. Open capsulectomy is the surgical scoring or excision of the capsule. This can be done in conjunction with an implant exchange

or removal without replacement, depending on the patient's wishes. Displacement of the implant is another source of deformity. The implant can ride too high, too low, too lateral or too medial. Many surgeons use several weeks of postoperative binding to prevent submuscular implants from riding too high. If implants are too low, a revision procedure reestablishing the IMF is usually required. If air bubbles remain in a saline-filled implant, audible sloshing can be heard which can be quite distressing to patients. Eppley has a technique of filling implants and removing air bubbles to prevent this problem[21]. Visible implant rippling is a complication of saline-filled implants, usually secondary to underfilling of the implant. When the implant is inadequately filled the folds in the shell can become visible in the superior pole, especially in a thin patient with a subglandular implant. Ripples can also be secondary to traction of the implant capsule on the subcutaneous tissue. This is more common with a textured implant.

Rupture is one of the most feared complications that patients have. Breast implants have a finite life. They all fail at some point. When a saline-filled implant ruptures, it is immediately apparent as the saline quickly escapes from the shell and deflation is apparent. With the use of silicone implants, it may be more subtle. Often it may not be discovered until a routine mammogram detects leak. The FDA advocates removal of any silicone implant that has a known rupture.

Cancer Detection in Augmented Women

Breast implants are not associated with an increased risk of breast cancer, however routine mammography is less accurate in augmented patients. This does not translate to larger tumors or worse prognosis for augmented patients [22-24]. Eklund's displacement technique

is indicated for augmented patients and has been shown to significantly increase the amount of breast tissue visible on mammography. The technique involves manually displacing the implant toward the chest wall and compressing only the breast tissue. Compared to standard techniques which revealed 56% of tissue in subglandular implants and 75% of tissue in submuscular implants, the Eklund's technique revealed 64% and 85% respectively [6, 25]. Women who have breast implants should undergo the same routine mammographic screening schedule as non-augmented patients and should receive their mammograms at a facility that is facile in the displacement techniques. It is also wise to get a baseline preoperative mammogram on any women older than 30 years of age.

Conclusion

Breast augmentation is a safe procedure that has remained very popular among American women. There are numerous variables that affect the operative plan and the final outcome. Careful patient selection and thoughtful perioperative planning enables aesthetic breast augmentation.

Financial Disclosure

None reported.

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1. True / False

After undergoing a breast augmentation via an axillary approach, a sentinel lymph node biopsy of the axilla is still possible.

2. A subglandular implant placement places the patient at higher risk for:

(A) Breast cancer

(B) Capsular contracture

(C) Superior migration of the implant

(D) Autoimmune disease

3. True / False

Currently in the United States, placement of all silicone implants require enrollment of the patient in an FDA-sponsored clinical trial.

4. In order to increase the accuracy of cancer screening in augmented patients, routine mammography should be performed at a facility that is facile in what technique?

(A) Needle localization

(B) Ultrasound

(C) Fine needle aspiration

(D) Ecklund's displacement technique

Answer form found on page 288

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Question 1:   True   False

Question 2:   a   b   c   d

Question 3:   True   False

Question 4:   a   b   c   d

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