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Improvement in Existing Chest Wall Irregularities During Breast Reconstruction

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Abstract

Mastectomies for both cancer resection and risk reduction are becoming more common. Existing chest wall irregularities are found in these women presenting for breast reconstruction after mastectomy and can pose reconstructive challenges. Women who desired breast reconstruction after mastectomy were evaluated preoperatively for existing chest wall irregularities. Case reports were selected to highlight common irregularities and methods for improving cosmetic outcome concurrently with breast reconstruction procedures. Muscular anomalies, pectus excavatum, scoliosis, polythelia case reports are discussed. Relevant data from the literature are presented. Chest wall irregularities are occasionally encountered in women who request breast reconstruction. Correction of these deformities is possible and safe during breast reconstruction and can lead to improved cosmetic outcome and patient satisfaction.

Keywords

breast reconstruction, chest wall irregularity, scoliosis, pectus excavatum, polythelia, muscular anomalies

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Background

One in 8 women will be diagnosed with breast cancer in her lifetime. Moreover, awareness and genetic testing for breast cancer susceptibility genes like BRCA are on the rise.[1] As such, mastectomies for both cancer resection and risk reduction are becoming more common. While oncologically sound outcomes are paramount, the plastic surgeon also has the goal of creating an aesthetically pleasing result for the patient. In addition to breast parenchymal asymmetries in size and contour, there are several chest wall anatomic variants that can be identified preoperatively or encountered during surgery that should prompt the surgeon to contemplate carefully the reconstructive options offered.

Muscular Anomalies

Muscular anomalies of the chest wall may be related to the absence of normal musculature or the presence of accessory musculature. Poland syndrome is a well-known constellation of symptoms involving aplasia of the chest wall and breast parenchyma. Many options for reconstruction have been described. Since breast parenchyma is absent, the incidence of breast cancer in this setting approaches zero.

More often encountered in breast reconstruction is accessory musculature. Sternalis is a muscular variant in the anterior chest wall that typically arises from the superior aspect of the sternum and inserts in a variety of locations including the pectoral fascia, inferior ribs, costal cartilages, rectus abdominis muscle sheath, or external oblique aponeurosis.[2] Its embryology remains controversial.[3] Incidence of sternalis approximates 8% in the total population.[4] The sternalis can be present unilaterally or bilaterally, though unilateral occurrence

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is more common, with preferential occurrence on the right side.[5] It has no apparent physiological function but has several clinical implications. It is reported to confound electrocardiogram reading and diagnosis of pathologic thoracic conditions[6] and has also been responsible for misinterpretation of mammography.[7] Although it is a relatively uncommon variant of human anatomy, during breast reconstruction, it can complicate the usually straightforward dissection of the submuscular pocket for placement of tissue expanders or implants following mastectomy, leading to a blunted medial pole and asymmetric cleavage. Plastic surgeons must also be aware of the existence of the sternalis as it may require additional dissection or excision during exposure of the internal mammary artery for free tissue transfer.

Pectus Excavatum

Pectus excavatum is a chest wall deformity characterized by an inward depression of the anterior chest wall including the sternum, xyphoid, and costal cartilages. It occurs in approximately 1 in every 1500 females. Conversely, pectus carinatum is anterior protrusion of the sternum and adjacent costal cartilages. The incidence of pectus excavatum is estimated to be between 0.1 and 0.8 per 100 individuals,[8] while pectus carinatum occurs 2 to 4 times less frequently.[9] Although many patients choose to undergo reconstructive surgery to correct the deformity, a fair number present to clinic with a diagnosis of breast cancer and have not been offered corrective surgery, found the risks of surgery unacceptable, or are unaware of the deformity. It is this group of patients that must be identified by the plastic surgeon to avoid undue symmastia associated with implant-based reconstruction.

In a 2009 article published by Beier et al, women with pectus excavatum were separated into 2 groups, one of which underwent repair of pectus excavatum and concurrent cosmetic breast augmentation and the other underwent pectus repair and delayed breast augmentation. They concluded that simultaneous implant placement was prone to cause symmastia and recommended delayed breast augmentation during subsequent removal of the metal plate.[10] Although this study did not involve patients with breast cancer, similar conclusions can be drawn concerning implant-based breast reconstruction in uncorrected or undercorrected pectus excavatum deformities. In a 2011 series by Moscona and Fodor, 11 patients underwent submuscular augmentation with wide silicone implants to improve breast contour and camouflage the chest wall deformity associated with previously untreated pectus excavatum. All patients were satisfied with the result, and none desired further surgical treatment for pectus excavatum.[11]

When untreated or undertreated pectus excavatum is identified in a patient presenting for mastectomy and reconstruction, operative plans should include careful dissection of the medial pocket with an assistant compressing the midline to avoid symmastia[12] as well as wider-based implant selection.

Scoliosis

Scoliosis is described as a 3-dimensional deformity of the spine with a deformation in the sagittal plane from thoracic lordosis, the frontal plane from lateral curvature, or the transverse plane from vertebral rotation.[13] Scoliosis in adults is seen in approximately 8% of the population over the age of 25 and increases to approximately 68% in individuals over the age of 60 secondary to degenerative changes that occur during the aging process.[14] Moreover, women with scoliosis who are exposed to an increased number of diagnostic radiographs during childhood and adolescence are at an increased risk of breast cancer.[15,16]

The presence of existing breast asymmetry in patients with scoliosis has been previously described.[17,18] Anecdotally, we find these patients also exhibit irregularities of the trunk, including unilateral prominence of the thoracic rib cage, difference in shoulder height, variance in location of the inframammary fold, discrepancy in rotation of the anterior superior iliac spines, abdominal lipodystrophy, and asymmetric abdominal fascial laxity.

Scoliosis poses a clinical scenario in which the surgeon is capable of improving existing asymmetry of the trunk while also performing breast reconstruction. After mastectomy when reconstruction is desired, flap reconstruction has largely become the procedure of choice for soft tissue coverage both in irradiated tissues and in patients who do not desire implant-based reconstruction. However, given the published high incidence of back pain associated with scoliosis (59%), certain reconstructive options should be avoided. Kim and Glazer published a case report of worsening scoliosis following latissimus dorsi reconstruction and an increase in Cobb angle from 44° to 60°.[19] In theory, avoiding harvest of muscle flaps in patients with scoliosis could prevent worsening back pain and curvature. Moreover, other trunk irregularities such as asymmetric lipodystrophy and fascial laxity can be improved with the low transverse abdominal incision and plication techniques during abdominally based muscle-sparing reconstruction.

Accessory Nipple

Polythelia, or accessory nipple(s), is a congenital anomaly characterized by supernumerary nipples found along the embryologic mammary ridge (the "milk line") from axilla to inguinal fold, sometimes within the areola.[20] The incidence of polythelia ranges from >1% to 6%, with the majority occurring sporadically.[21] While polythelia may be an aesthetic concern, it is usually a benign condition.[22] Supernumerary nipples can appear similar to the nipple-areola structure on the breast or can be small, resembling nevi.[23]

Plastic surgeons should be aware of existing polythelia as it may present issues during reconstruction. Breast surgery and plastic surgery teams should work together to design skin incisions that will allow the breast surgeon adequate access to remove the breast tissue and lymph nodes when indicated, while still placing scars in aesthetically acceptable locations.

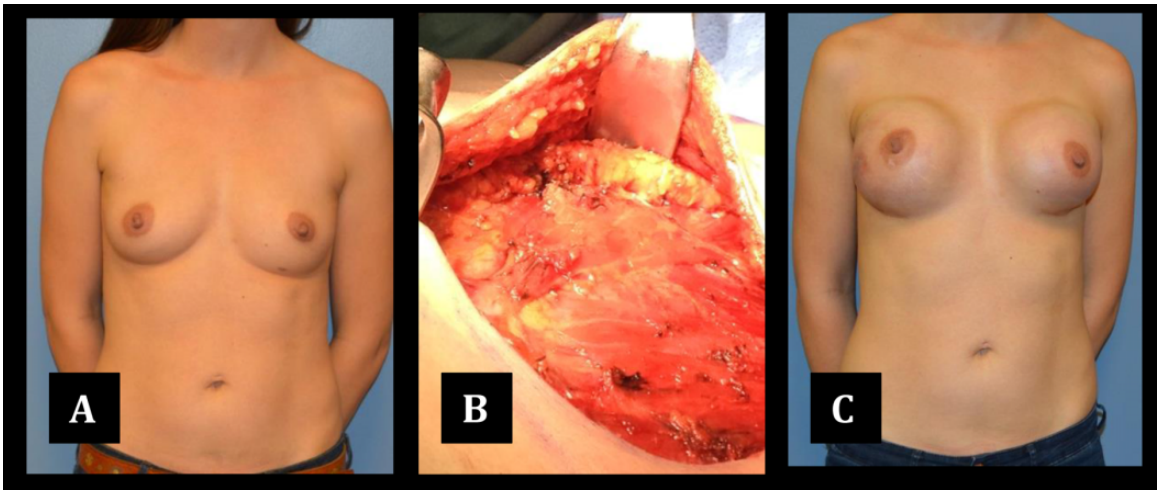

Figure 1. A, Preoperative photo showing breast asymmetry. The left inframammary fold is more inferior than the right inframammary fold. B, Sternalis muscle seen intraoperatively overlying the left pectoralis major muscle parallel to the sternum. C, Patient 8 weeks postoperatively with tissue expanders filled to 550 mL. Symmetry of the pocket was achieved with generous release of the sternalis anatomic variant.

Nipple-sparing mastectomy is sometimes an option, however often based on tumor location or improper position of the nipple it is not. In cases when the native nipple must be excised with the specimen and sent to pathology, reconstructive options may be expanded by creative use of an accessory nipple. Excision and free nipple grafting of accessory nipple from the abdomen or contralateral breast for ultimate nipple reconstruction has been described with good result.[24] In addition, excision of eccentric accessory nipples as a concurrent procedure during mastectomy and/or reconstruction can aid in overall patient satisfaction as well as help tailor the desired skin envelope.

At our high-volume institution, chest wall irregularities are routinely taken into consideration in order to achieve symmetric and aesthetically pleasing outcomes and avoid undue pain and functional deficits. The surgeon should thoroughly evaluate the patient's trunk characteristics before and during surgery to obtain optimal results.

Methods

Women who presented for breast reconstruction after mastectomy were evaluated preoperatively for existing chest wall irregularities. Case reports were selected to highlight common irregularities and methods for improving cosmetic outcome concurrently with breast reconstruction procedures.

Results

Case Report: Muscular Anomalies—Sternalis

The patient is a 32-year-old female with infiltrating ductal carcinoma of the right breast. On physical examination, the patient had 32A breast size. The left inframammary fold was located more inferiorly compared to the right. The patient underwent right skin and nipple-sparring mastectomy and left prophylactic skin and nipple-sparing mastectomy with immediate tissue expander placement bilaterally. Intraoperatively, the patient was found to have a left-sided sternalis muscle oriented parallel to the sternum and anteromedial to the pectoralis major muscle (Figure 1). No sternalis muscle was present on the right. Care was taken to release the sternalis inferiorly in order to allow medial dissection of the pectoralis and avoid a blunted medial pole and asymmetric cleavage. The pectoralis major muscle was separated from the sternalis muscle and elevated along with a portion of the serratus anterior inferolaterally to form the complete submuscular pocket for tissue expander placement. A similar pocket was created on the right and tissue expanders were placed bilaterally. A second operation was ultimately completed to exchange the tissue expanders for permanent implants. Symmetry of the breasts was achieved despite the asymmetric musculature.

Case Report: Pectus Excavatum

The patient is a 31-year-old female who presented with right breast invasive ductal carcinoma. On preoperative evaluation, she was noted to have concavity of the midline chest wall consistent with pectus excavatum. She had B-cup breasts with minimal ptosis and good symmetry, but poor cleavage. She underwent bilateral skin-sparing mastectomies with immediate placement of tissue expanders. Intraoperatively, care was taken during dissection of the submuscular pocket medially to avoid symmastia. After tissue expansion, she underwent exchange for permanent 650 mL implants and subsequent bilateral nipple reconstruction(Figure 2). With final implants significantly larger than her native breasts, her existing chest wall deformity was masked. She did not develop symmastia. The patient was pleased with her final result.

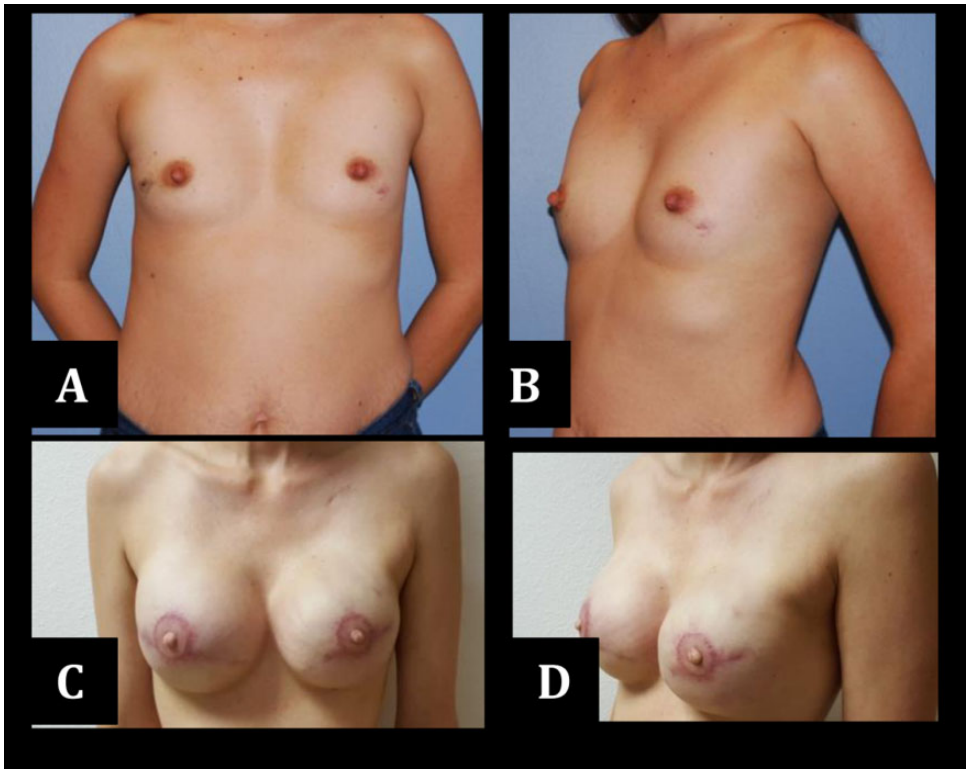

Figure 2. A, Preoperative anterior view of pectus excavatum in patient with breast cancer. B, Lateral view highlighting midline depression of sternum. C, Postoperative anterior view after bilateral skin-sparing mastectomy with implant-based reconstruction, nipple reconstruction, and fat grafting. D, Lateral view reveals improvement in overall chest contour with reconstructed breasts camouflaging depressed sternum.

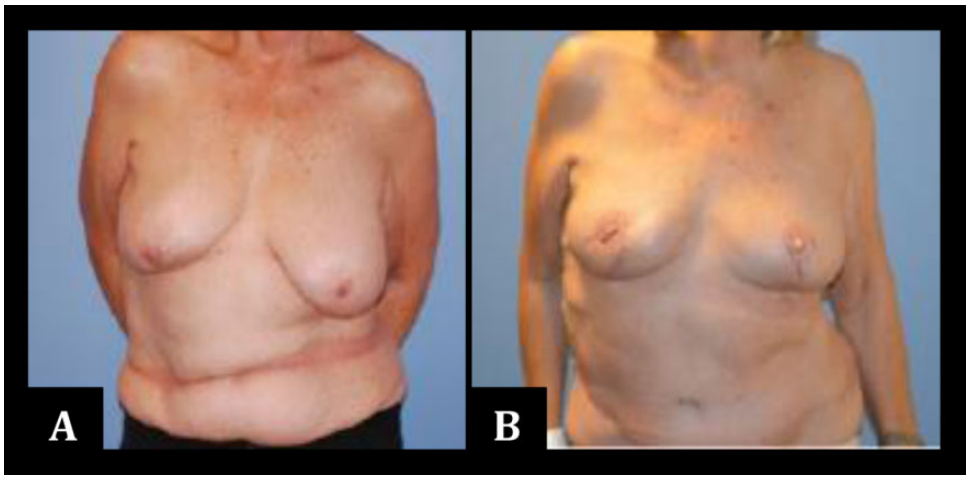

Figure 3. A, Preoperative anterior view of the patient exhibiting curvature of the spine with right shoulder and right inframammary fold higher than left. B, Postoperative anterior view after bilateral deep inferior epigastric artery perforator (DIEP) flaps including elevation of left inframammary fold and improved symmetry of breast volume and nipple location.

Case Report: Scoliosis

The patient is a 64-year-old female with multicentric invasive ductal carcinoma of the right breast and existing scoliosis. She had undergone multiple spine surgeries, but continued to have curvature of thoracic spine such that at rest the right shoulder was significantly higher than the left. On preoperative examination, the right breast appeared smaller and less ptotic than the left, with inframammary fold 3 cm higher than the left. She underwent bilateral skin-sparing mastectomy and immediate bilateral deep inferior epigastric artery perforator flap

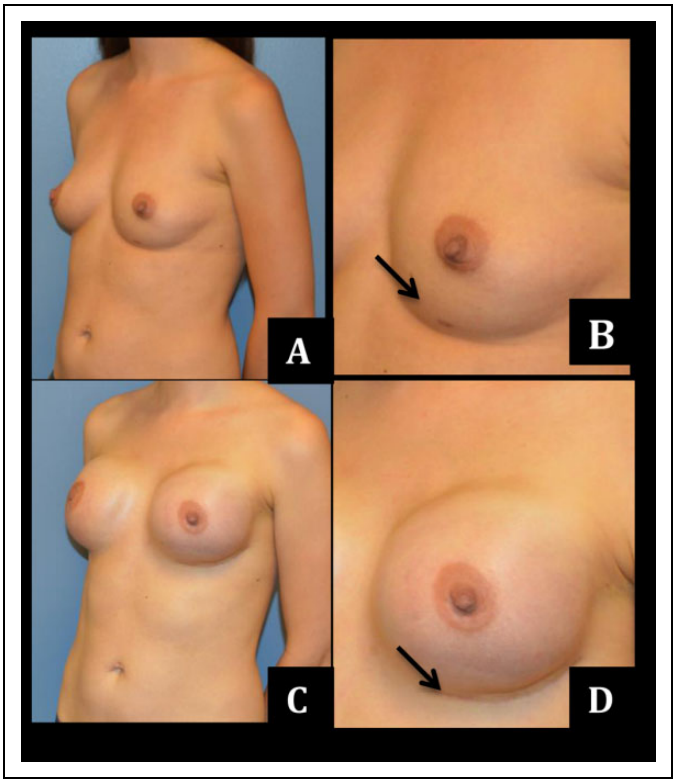

Figure 4. A, Preoperative oblique photo of patient with polythelia on right. B, Close-up photo with arrow highlighting accessory nipple. C, Postoperative oblique photo after mastectomy and reconstruction including excision of accessory nipple. D, Arrow highlights previous location.

reconstruction. This option was chosen in order to avoid increase in back pain sometimes seen after muscle-based reconstruction. Subsequently, she had bilateral nipple reconstruction (Figure 3). By lifting the inframammary fold on the left breast and creating flaps that were more similar in volume than the patient's native breasts, her existing chest wall curvature was disguised. Moreover, her existing asymmetric abdominal lipodystrophy was improved with closure of the donor site. The patient was pleased with her postoperative outcome and did not exhibit pain or worsening of her scoliosis as a result of her procedure as it did not require use of trunk musculature.

Case Report: Accessory Nipple

The patient is a 32-year-old female with right breast infiltrating ductal carcinoma. On physical examination, she was noted to have polythelia on her right breast along the milk line inferior to her primary nipple (Figure 4). The patient underwent bilateral skin and nipple-sparing mastectomy with immediate tissue expander placement bilaterally. During this procedure, a transversely oriented incision at her inframammary fold was utilized in order to address the accessory nipple. During closure, the accessory nipple was excised and the scar was kept within the fold. She was subsequently exchanged to permanent implants. The patient has satisfactory result without an additional procedure to address her accessory nipple.

Discussion:

All patients interested in breast surgery, whether cosmetic or reconstructive, should undergo preoperative evaluation during which existing irregularities are brought to the attention of both the surgeon and the patient. Such as in the case of severe scoliosis, the patient may be painfully aware of the existing curvature of her spine; however, many asymmetries are more subtle and noticeable only to the trained eye. Preoperative measurements and photographs are imperative. Prior to surgery, the process of obtaining informed consent should include counseling about the various options available and the risk of ongoing asymmetry after surgery. The patient should be educated that everybody is unique; anomalous chest wall characteristics are not necessarily a detriment but can sometimes offer reconstructive options that are not available in patients with "normal" trunks.

Conclusion

Taking note of irregularities during preoperative evaluation for breast reconstruction is the first step in correcting them. We have highlighted 4 key chest wall characteristics that may contribute to dissatisfaction after breast reconstruction. Correction of these deformities is possible and safe during breast reconstruction and can lead to improved cosmetic outcome and patient satisfaction.

Declaration of Conflicting Interests

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