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Reduction mammaplasty in the adolescent female: The URMC experience

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ABSTRACT

Introduction: With the rise in childhood obesity, an increase in the number of patients seeking adolescent breast reduction has been appreciated. This study examines our experience with presenting symptoms, techniques, and both surgical and pathologic outcomes for reduction mammaplasty in the adolescent population.

Methods: Medical records of 76 consecutive patients under 18 years of age who underwent reduction mammaplasty over a 10 year period were identified and reviewed for BMI, symptoms, comorbidities, cancer history, surgical technique, resection weight, pathologic findings, and complications. Pathology costs were determined from billing records.

Results: Operative indications included neck, back, and/or shoulder pain (75%), intertrigo (8%), shoulder grooving (17%), difficulty finding bras (8%) and participating in sports (9%), and social distress (24%). Average BMI was 31 kg/m^2 and 65% of children were obese (BMI $>$ 30). Surgical techniques included Wise pattern (93%) and superior pedicle (7%). Complications occurred in 8 patients (10.5%). Pathologic examination yielded no cancers with 80% normal or mildly fibrotic and 20% benign histology. Per breast reduction specimen, pathology internal costs and external costs by Medicare data averaged $65 and $118, respectively.

Conclusions: Adolescent mammaplasty patients present symptoms mirroring those of the adult population but also exhibit greater obesity, physical strain, social distress, and comorbid psychiatric disorders. Literature reports similar complication rates for adults as we found in our adolescent population. We recommend that surgeons strongly consider reduction mammaplasty in the carefully selected adolescent with macromastia, with realistic expectations and complications in this burgeoning group. Routine pathologic examination, however, is not a cost effective goal.

1. Introduction

Reduction mammaplasty is commonly performed to address symptoms related to macromastia.[1,2] The etiology of macromastia in pubertal and parapubertal females is variable and includes endocrine changes, childhood obesity, and juvenile (virginal) hypertrophy of the breast.[3–5] Clearly, the hormonal influences, including estrogen receptor hypersensitivity, on breast development are complex and have been discussed elsewhere.[6,7] Benefits of reduction mammaplasty include resolution of pain, improved quality of life, extroversion, and emotional stability.[8] Previous work has focused on reduction mammaplasty outcomes in populations greater than 18 years of age; however, little is known regarding outcomes for a growing number of adolescent females seeking breast reduction.[9–12]

Adolescents requesting reduction mammaplasty require special considerations given the procedure's relation to future sequelae such as decreased nipple sensation, ability to lactate, breast changes after pregnancy, and mammographic evaluation,[13,14] coupled with the procedure's permanence.[15] Medical comorbidities such as childhood obesity, bulimia nervosa, and body image issues must also be considered.[15–17] Taken together, these considerations make an informed choice regarding surgical intervention vitally important.

Surgical intervention may be warranted in the adolescent population depending upon severity of symptoms and patient quality of life. Breast hypertrophy should be addressed when it leads to extreme embarrassment, unwanted attention from boys, psychologic difficulties, severe neck and back pain, kyphotic posture, headaches (due to neck strain), dermatitis and ulceration, breast tissue necrosis, stretching and flattening of the areola, difficulty with desired activities, problems finding clothes that fit, brachial plexus-induced paresthesias, thoracic compression leading to respiratory distress, and increased spinal curvature for massively enlarged breasts.[18] Beyond addressing patient concerns of pain and

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self-image, reduction mammaplasty may also be employed to treat rare conditions such as benign phyllodes tumors[19] and juvenile breast hypertrophy.[20–23]

With the heightened social, psychological, and physical strains of adolescent macromastia, surgeons should consider reduction mammaplasty as a therapeutic option for this unique population. Here we discuss the largest known study to date of the indications, evaluation, surgical approach, and special considerations of the female adolescent seeking breast reduction surgery.

2. Methods

The Division of Plastic Surgery billing records were searched for reduction mammaplasty Current Procedural Terminology (CPT) and International Statistical Classification of Diseases and Related Health Problems (ICD9) codes between the years 1999 and 2009. Identified patients were then sorted by gender and date of birth. The medical records of only female patients under the age of 18 at the time of surgery was chosen for examination. Office and electronic charts were reviewed for Body Mass Index (BMI), presenting symptoms (including back, neck, and shoulder pain; shoulder grooving; intertrigo; difficulty finding bras; and inability to play sports), comorbidities (including social distress), cancer history (including family history), breast characteristics (pre-operative size, asymmetry, ptosis grade, sternal notch to nipple measurements, and nipple to inframammary fold distance) and complications. Social distress included only physician-diagnosed and treated psychiatric problems (e.g., anxiety, Post-Traumatic Stress Disorder (PTSD), depression).

A personal pregnancy history was also recorded, including patients' intent to breastfeed in the future. Operative notes and pathology reports were reviewed for technique, complications, resection weights and both gross and microscopic pathologic findings. Internal costs of pathologic screening consisted of space, specimen processing, pathologic examination, and transcription costs. External costs paid by third parties were determined by reviewing billing records in the Department of Surgical Pathology.

Categorical variables (pre-operative breast size and ptosis grade) were compared with BMI using Chi-Square analysis. Continuous variables (sternal notch to nipple distance, nipple to inframammary fold distance, and resection weights) were analyzed for association with BMI using linear regression. Statistical significance was achieved with $p < 0.05$. Attempts to employ multivariate analysis for stratification of risk factors for complications were limited by a small sample size.

3. Results

Over a seven-year period from 2002 to 2009, 76 consecutive adolescent (ages 13–18) patients underwent breast reduction, with an average age of 16 years and 5 months. These patients had an average BMI of 34 kg/m^2 and 65% were obese (BMI $>$ 30). Self-reported presenting symptoms included neck, back and/or shoulder pain (50), intertrigo (7), shoulder grooving (14), difficulty finding bras (6), and difficulty participating in sports (7). Social distress was reported in 29% of patients. Seven patients reported a family history positive for breast cancer; however no patients had a personal history of breast malignancy.

The average pre-operative bra cup size was DDD. Asymmetry was reported in 83% of patients; 78% of patients had grade 2 or 3 ptosis. Average sternal notch to nipple (SN:N) measurement was 26.2 cm (4.8 cm) with an average difference between breasts of 2.8 cm (1.1 cm). The average nipple to inframammary fold distance (N:IMF) was 12.8 cm (1.1) with an average difference between breasts of 0.7 cm (0.4). SN:N and N:IMF measurements did not significantly correlate with patient BMI with corresponding p values of 1.6 and 0.88 respectively.

Surgical correction was approached through a standard inferior pedicle Wise pattern technique in 91% of patients; 8% were corrected with a superior pedicle technique. Notably, 65% of the last 20 patients ($n = 13$) were corrected with a superiormedial pedicle-based reduction. Postoperative complications were reported in 8 patients (10.5%). These complications included 4 partial wound dehiscences, 3 seromas, 2 cases of cellulitis, and 1 partial nipple loss. All of these patients were managed without return to the operating room. No complications were able to be attributed to medical comorbidities in univariate or multivariate regression analysis due to our limited sample size.

The average resection weights were 743.3 g and 762.5 g on the right and left breasts, respectively. Review of breast pathology revealed no malignant transformations. Normal to mildly fibrotic disease was seen in 80% ($n = 61$) of patients and 20% ($n = 15$) had benign pathology consisting of fibroadenoma, fibrocystic change, or ductal hyperplasia without atypia. These diagnoses carried an average internal cost of $65 and external cost of $118 (Medicare data) per reduction specimen. The Department of Pathology received average reimbursements $50 per breast reduction specimen.

4. Discussion

The United States faces an adolescent obesity epidemic – the incidence of obesity tripled between 1970 and 2000, with concomitant increases of 3.6–49.7% in metabolic syndrome among severely obese children.[24] In the 20th century, dramatic decreases in the average ages of menarche and thelarche link strongly to childhood obesity,[25] fast food consumption, and decreasing physical activity.[26] Among obese girls, precocious breast development and higher Dehydroepiandrosterone sulfate (DHEAS) levels are evident,[10] along with a two- to nine-fold increase in mean free testosterone and hyperinsulinemia[27]; increased leptin may be responsible for rises in these adrenal androgen levels.[28] Infant nutrition is associated with subsequent developmental abnormalities, including insulin resistance, exaggerated adrenarche, and accelerated pubertal development.[29] Infant BMI at 36 months may project future obesity and helps identify those at risk for early puberty.[30] Tadiparthi has described using BMI in assessing patients for breast reduction surgery.[31] As BMI increases and the age of pubertal onset decreases, we hypothesize that there will be greater numbers of adolescents with macromastia seeking mammaplasty for symptomatic relief.

It goes without saying that when obesity is the underlying cause of macromastia, every effort should be made to lose weight prior to undergoing breast reduction surgery. While there is no known publication objectively addressing outcomes of reduction in breast size following weight loss, it stands within reason that some size reduction will occur. Depending on the size of the breast, further reduction through surgery may ultimately still be necessary; if nothing else than to correct ptosis, skin excess, or areola widening. Our group has recently shown in the adult massive weight loss population (>50 lbs) that women who undergo breast reduction surgery prior to weight loss go on to lose more weight than those who attempt weight loss first. This suggests that women are often unable to exercise with their current breast size secondary to neck, back, or shoulder pain, and/or embarrassment with exercise. Therefore, the ability to exercise with the patients current breast size must be considered.

Obese patients have higher complication rates than their counterparts with normal body weight, evidenced by the relationship between specimen weight per breast and subsequent complications,[32] as well as a correlation between BMI and delayed wound healing.[33] Moreover, beyond the symptoms of macromastia shared by adult patients, there are special considerations in the young population, including future lactational success, nipple sensation, changes in breast morphology upon subsequent pregnancy, and weight loss or gain, the last of which our institution is currently investigating. While these issues are commonly associated with females, it must also be mentioned that adolescent males with gynecomastia possess many of the same disabilities. This discussion is outside the scope of this manuscript as techniques and outcomes are often not comparable between genders for differing reasons.

Reduction mammaplasty in the adolescent population remains controversial due to continued breast tissue growth with maturation, the permanence of the procedure, and the potential development of complications. Unfortunately, secondary breast growth may lead to symptom recurrence. While the majority of patients may demonstrate varying degrees of breast tissue re-growth, symptomatic relief and long-term patient satisfaction persist 6 years following surgical intervention; 94% of patients would undergo their procedure again.[34] In addition, one must consider well-established psychiatric implications of obesity and macromastia, including depression and bulimia nervosa.[16,35] Adolescent patients have been previously described with body-image disorders and concomitant macromastia.[16,17] These patients report improved physical symptoms with reduction mammaplasty (pain, posture, exercise tolerance) and are better able to find appropriately fitting clothes. In a series by Losee et al., 6 patients had greatly reduced or completely eliminated their eating disorder symptoms post-reduction mammaplasty and had markedly improved body image.[16] Whether these issues are resolved in our population following breast reduction remains to be determined, but our preliminary, short-term follow-up results are promising, with dissemination of this data in the near future. High rates of patient satisfaction coupled with relatively low rates of complications demonstrate that reduction mammaplasty is a safe and reliable option for the symptomatic adolescent patient with macromastia.

A major concern with adolescent mammaplasty reduction has been postoperative lactation. In a study following 334 patients after inferior pedicle reduction mammaplasty, 78 patients delivered children, 15 breastfed exclusively, and 8 breastfed with formula supplementation. Forty-one (52.6%) never attempted to breastfeed and 14 patients were unsuccessful at breastfeeding. Of those 41 who did not breastfeed, 31 had breast engorgement and lactation; 19 reported they would have been able to breastfeed if they had so chosen to do so.[36] In 2007, Cruz et al. did not find a significant association between superiorly, medially, or inferiorly-based reduction mammaplasties and lactational performance; however, nipple sensation was impaired or absent in 2% of patients.[37] The rate of breastfeeding success was similar among patients with medial pedicle vertical reductions and women without prior breast surgery.[38] Rather than operative technique or adequate subareolar tissue preservation, healthcare provider encouragement was most predictive of breastfeeding success.[39] Regardless, the patient must always be cautioned of the potential inability to breastfeed.

Superior pedicle approaches are increasingly being employed for reduction mammaplasty in both adult and adolescent populations. Studies cite high patient satisfaction and long-term preservation of breast shape with low complication rates or need for revision.[40] The superomedial pedicle is safe and reliable for large resections as seen with gigantomastia patients (macromastia exceeding 1 kg).[41] Vertical scar reduction mammoplasty consistently produces a more aesthetic breast shape, leaving less scarring and greater superior pole fullness than traditional inferior pedicle approaches employing Wise pattern incisions.[42] A lingering criticism of this approach, however, is inadequacy of resection, given difficulty gauging the ultimate long-term aesthetic result when faced with the characteristic exaggerated appearance of the resected breast in the operating room. Incision placement is crucial in the approach to adolescent mammaplasty reduction; scars should be minimized whenever possible.[43]

The composition of adult macromastic breast is primarily adipose tissue,[44] and over 60% of specimens demonstrate histological abnormalities at the time of reduction mammaplasty.[45] In a study of 1289 breast reduction specimens, 2% showed uncertain malignant potential, 0.3% demonstrated ductal carcinoma in situ, and 0.1% contained invasive carcinoma (range 14–78 years, mean 36.8 years). Dotto et al.[46] showed that advanced age increased the risk for malignancy – patients over 40 years of age should receive pre-operative mammography, specimen orientation, and margin inking with one color.[47] However, Dehner et al.[48] conclude that fibroadenomas comprise the majority of pediatric breast masses and that malignant breast tumors are likely to be metastatic or secondary in origin. Patients younger than 35 with intraductal papillomas may be at increased risk for future malignancy.[49,50]

Based on the cost determined by our pathologic review and incidence of breast malignancy from United States in patients under the age of 18(0.08 cases per 100,000), the resulting cost of one breast cancer diagnosis in all mammaplasty specimens is approximately $147 million. Given the extremely low rates of occult malignancy and high rate of benign lesions in younger patient populations, the role for routine pathologic specimen evaluation remains unclear. Ishag et al. examined adult breast reduction specimens from 560 patients spanning an 11.5 year period and calculated a cost of $44,000 to identify 4 patients with carcinoma and 8 with atypical hyperplasia. All of their patients with either carcinoma or atypical hyperplasia were older than 40 years.[51] Clearly, the literature demonstrates that screening pathology exhibits high specificity but low sensitivity for diagnosis of malignancy, with large volumes of resection needed for a single diagnosis, coupled with a low pre-test probability for malignancy.

5. Conclusions

Adolescent macromastia can be a deforming, distressing, and disabling condition. Presenting symptoms of adolescent mammaplasty patients mirror those seen in the adult population. However, compared to historic controls for the adult population, the adolescent population displays greater obesity and presents with increased social distress and comorbid psychiatric disorders. Complication rates in the adolescent population are similar to those suggested by the adult literature. Furthermore, due to the extremely low incidence of occult malignancy in the adolescent population, the cost of routine pathologic examination represents an unneeded healthcare expenditure. Thus, surgeons should feel comfortable and obliged to perform reduction mammaplasty in the carefully selected adolescent patient, where with proper consent and expectations for complications, surgery may help alleviate the increased social, psychological, and physical strain caused by macromastia.

Conflicts of interest

None of the authors has a financial interest in any of the products, devices, or drugs mentioned in this article.

Ethical approval

This study was approved by our institutional research subjects review board.

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