

Hyperplastic Breast Anomalies in the Female Adolescent Breast

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Abstract

Macromastia in adolescents is multifactorial and usually idiopathic, associated with obesity or hormonal imbalances. Less commonly, it can result from virginal or juvenile breast hypertrophy, a rare condition of unknown etiology, where an alarmingly rapid breast enlargement occurs during puberty. Breast hypertrophy in the adolescent population can have significant long-term medical and psychological impacts. Although symptoms can be severe, many plastic surgeons, pediatricians, and parents are often reluctant to surgically treat adolescent macromastia. However, reduction mammoplasty is a safe and effective treatment and may be the only way to alleviate the increased social, psychological, and physical strain caused by macromastia in adolescents.

Keywords

- ▶ adolescent
- ▶ macromastia
- ▶ juvenile breast hypertrophy
- ▶ reduction mammoplasty

The development of macromastia in adolescence leads to a deforming and distressing condition during a sensitive period in a girl's life. Vulnerability to developing a negative body image and the desire to fit in predisposes these female adolescents to significant psychosocial stressors. Social issues arise secondary to poor fitting clothing, trouble exercising, and public scrutiny resulting from their enlarged breasts. In addition, physical ailments including back pain, shoulder pain, and intertrigo at the inframammary folds cause further anguish. Many of these problems can be improved with breast reduction surgery.

The demand for plastic surgery procedures among adolescent girls has recently increased, including the demand for breast reduction.¹ It is unclear whether this reflects an upsurge in the incidence of adolescent breast hypertrophy and/or obesity, or if it is due to a lower threshold for surgical consultation. Outcomes of reduction mammoplasty have been well studied in adults.^{2–9} As plastic surgeons increasingly offer reduction mammoplasty to adolescent girls suffering from breast hypertrophy, a growing number of outcome studies in adolescents are available.^{10–13} When considering reduction mammoplasty in a teenager, an accurate diagnosis and a rigorous treatment

plan require a team approach, including pediatric, medical, and surgical disciplines.

Etiology

The differential diagnosis of hyperplastic breast anomalies in adolescents includes pregnancy, fibrocystic disease, adolescent macromastia, virginal (or juvenile) breast hypertrophy, tumors of the breast (e.g., juvenile fibroadenoma, phyllodes tumor, juvenile papillomatosis), and excessive endogenous or exogenous hormonal levels. Malignant tumors of the breast are extremely rare in the adolescent population.^{14–16} However, these pathologies should be considered, especially in the presence of breast asymmetry. A comprehensive review of benign and malignant breast masses in adolescents is beyond the scope of this article; this topic is reviewed in detail elsewhere in this publication.

Adolescent Macromastia

In adolescent macromastia, breast enlargement develops throughout puberty with sustained steady breast growth (▶**Fig. 1**). Associated breast asymmetry can be observed. With the current obesity epidemic, it may become

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Fig. 1 Preoperative and 1-week postoperative photographs. Adolescent macromastia in a 17-year-old girl who underwent bilateral reduction mammoplasty with removal of 650 g of breast tissue per side.

increasingly difficult to distinguish adolescents with macromastia from patients with obesity-related breast hypertrophy alone.^{2,17,18} As the incidence of breast hypertrophy increases in the general population, including adolescent girls, some suggest that it may be a consequence of an increasingly unhealthy lifestyle, a hormone-laden diet, and obesity.¹⁹

Virginal or Juvenile Breast Hypertrophy

Juvenile (or virginal) breast hypertrophy is a rare and incapacitating condition where an atypical, alarmingly rapid and continued breast growth occurs during puberty (→**Fig. 2A**). It

is often defined as a 6-month period of extreme breast enlargement, superseded by a longer period of slower, but sustained breast growth.^{20–22} This enlargement may be unilateral or bilateral, and can occur at any time during puberty, sometimes occurring with the onset of thelarche. The term *gigantomastia* may be used to refer to cases of extreme breast enlargement.

The underlying mechanism causing juvenile breast hypertrophy has not yet been elucidated. One proposed theory is an end-organ hypersensitivity to normal levels of gonadal hormones.²⁰ An alternative hypothesis is that there is



Fig. 2 (A) Preoperative, and (B), 1-week postoperative photographs. Virginal (juvenile) breast hypertrophy in a 14-year-old girl. Reduction mammoplasty was performed. Recurrence of breast hypertrophy and mastalgia was observed 2 months after surgery. Tamoxifen was initiated and stabilization of breast growth has been observed. No additional surgery has been performed.

increased hormonal activity. However, previous studies have found normal levels of estrogen, progesterone, gonadotropins, and growth hormone during this rapid growth phase.²³ These hypotheses are at the root of pharmacotherapeutic attempts to control this condition, using drugs such as tamoxifen, danazol, or bromocriptine.^{24,25} Safety and efficacy of pharmacotherapy in virginal breast hypertrophy is currently unknown. The majority of adolescents diagnosed with this condition eventually undergo reduction mammoplasty, once the breast size is stabilized. There are anecdotal reports of familial cases of virginal breast hypertrophy associated with Cowden syndrome, a rare autosomal dominant disorder caused by a mutation of the PTEN (phosphatase and tensin homologue) tumor suppressor gene located on the long (q) arm of chromosome 10.²⁶ Cowden syndrome is characterized by multiple hamartomatous lesions and increased risk of breast, endometrial, gastrointestinal, and thyroid cancer, among other features.²⁷ In 2002, a study by Li et al on a murine model implicated PTEN gene abnormalities as a possible factor in precocious puberty, excessive ductal hyperplasia, and reduction of cellular apoptosis.²⁸ Further investigation of this association is warranted.

Clinical Presentation

The presentation of breast hypertrophy in adolescents is very similar to that of adults. Neck pain, shoulder pain and back pain are frequent complaints.²⁹ Shoulder grooving from brassiere straps, along with skin irritation or intertrigo are also frequently seen. In virginal breast hypertrophy, adolescents will present with extremely rapid breast growth, often accompanied by skin hyperemia, dilated subcutaneous veins, and skin necrosis depending on the growth velocity.^{21,23,30,31}

As reported in adults with macromastia, adolescents with breast hypertrophy suffer from significant emotional distress.¹⁰ The physical transformations characteristic of adolescence, combined with new personal responsibilities, complex relationships, and a budding awareness of human sexuality may contribute to emotional instability. This occurs along with a significant social pressure to fit in. Embarrassment, dissatisfaction with body image, poor self-esteem, and

disordered eating habits may be observed in many adolescents, including those suffering from breast hypertrophy.^{10,11,32,33} Teenagers with macromastia frequently report that their breasts inhibit their ability to participate in sports and in certain social activities.^{10,11,32,34} Unfortunately, adolescents often internalize these stressors and fail to seek appropriate help. Early identification and consultation to seek management may help improve quality of life in this population.

History and Physical Examination

A comprehensive medical, psychological, and surgical history should be obtained. Height, weight, and body mass index (BMI) should be assessed. Pubertal development and onset of thelarche should be noted. Breast growth, velocity, and stability should be assessed, in addition to the presence of any masses, chest wall deformity, or breast deformity. It should be noted whether the breast enlargement is unilateral or bilateral. Family history regarding breast disorders, particularly relating to breast hypertrophy, breast cancer, and previous treatments is relevant. An evaluation of patient maturity, self-esteem, and eating disorder behaviors should be performed.

Physical examination of patients with macromastia will typically reveal normal sexual development with disproportionately enlarged breasts. The breasts are generally large, heavy, and pendulous with widened areolas. Skin quality should be carefully evaluated, including the presence of striae and intertrigo. All quadrants of the breast must be carefully palpated for masses and irregularities. During the examination, it is important to assess the degree of breast ptosis as this may influence surgical treatment planning.

The evaluation should include an assessment of puberty and menstrual cycle. Ultrasonography or rarely magnetic resonance imaging may be used to rule out other conditions, particularly if mass lesions are present.

Surgical Indication

Teens suffering from breast hypertrophy should demonstrate emotional maturity and a keen understanding of the

limitations of plastic surgery when considering reduction mammoplasty. The surgeon should carefully discuss the indications, goals, risks, and possible complications of the procedure, and the patient, parent, and/or guardian must provide informed consent for the procedure. The patient assessment, discussion, and decision-making process may require more than one consultation. In some cases, an agreement about the procedure cannot be reached. When this occurs, the physician should meticulously and thoroughly educate patients and their families. The delicate balance in the relationship between the adolescents and the parents should be taken into consideration during this process.

Health insurance providers inconsistently cover reduction mammoplasty, and the amount of breast tissue to be removed to meet coverage criteria may exceed patient expectations. In the United States, health insurance requirements routinely include documentation of neck, shoulder, and/or back pain, shoulder grooving from brassiere straps, skin changes under the breast fold, in addition to a defined planned volume of tissue to be resected based on variable criteria such as the Schnur Sliding Scale,^{3,35} or other variable criteria such as a set amount of breast tissue to be resected from each breast (e.g., a minimum of 500 g per side). Of note, these standards vary between health insurance plans, and also between countries. Surgeons should continuously advocate for coverage of adolescent reduction mammoplasty by health insurers and press them to take into account the particular surgical indications in the adolescent population.

The symptoms prompting breast reduction surgery in teenagers have been described above and are similar to those seen in adults with macromastia. However, caution should be exercised not to perform reduction mammoplasty without having ascertained that adolescents have no ulterior motives to seek a reduction in breast size (e.g., a desire to improve athletic performance, a prior history of sexual abuse). Discordance between reported symptoms and clinical assessment should raise a red flag. Reduction mammoplasty is associated with risks and complications, and should only be performed in cases where potential benefits outweigh the risks.

Prior to surgery, breasts size should be stable for 6 to 12 months to achieve optimal outcomes. In cases of juvenile breast hypertrophy, delaying surgery until the breast size is stable should be attempted. Surgeons should recognize that high recurrence rates are observed with this condition when growth stability is not achieved prior to reduction mammoplasty.^{13,30} Preoperative counseling should include a thorough discussion on: (1) the long-term outcomes of breast reduction, including the possible need for subsequent surgery following pregnancy and/or weight variations; and (2) the impact of reduction mammoplasty on breastfeeding and nipple sensation.

Treatment

Adolescent Macromastia

Reduction mammoplasty is well accepted as a first-line treatment for symptomatic macromastia (►Fig. 1). It successfully alleviates discomfort and helps eliminate skin break-

down and infection commonly associated with breast hypertrophy.^{10,34,36,37} Several breast reduction techniques have been described. A complete review of these procedures is beyond the scope of this article.

The optimal surgical candidate is a patient who has reached or is near skeletal maturity, does not smoke, and does not have any psychological or physical health contraindications. In the ideal setting, an interdisciplinary team will perform a comprehensive patient evaluation to identify disordered eating behaviors, unstable psychological conditions, and offer counseling and support for weight loss if needed. An obese patient should be encouraged to lose weight prior to surgery, as significant weight loss following reduction mammoplasty may result in inferior outcomes and patient dissatisfaction.³⁸ Unfortunately, adolescents suffering from both obesity and macromastia may find it challenging to lose weight as their large breast size may pose a barrier to physical activity. These considerations make obesity an important comorbidity to address in the management and treatment of adolescent macromastia. Although treatment of pediatric obesity is encouraged, withholding surgery to achieve weight normalcy is unwarranted. In fact, reduction mammoplasty may serve as a motivating factor for continued weight loss and exercise.³⁹

Virginal or Juvenile Breast Hypertrophy

Both surgical and medical treatments have been attempted to manage virginal or juvenile breast hypertrophy. Timely management of this condition is the main priority. Surgical options for this condition include reduction mammoplasty with or without free nipple graft (►Fig. 2B), or in extreme cases, subcutaneous mastectomy and breast reconstruction in an immediate or delayed fashion. A carefully planned reduction mammoplasty following a period of observation to confirm breast growth stabilization is recommended in the majority of cases and may occasionally be sufficient to result in successful and complete relief of this distressing condition. Plastic surgeons evaluating patients suffering from virginal breast hypertrophy must resist the temptation of offering immediate surgery in the face of distressed patients and pressuring families. Untimely surgery in the active growth phase has been associated with recurrence of breast enlargement postoperatively, and need for additional procedures. Several cases of postoperative recurrence have been reported in the literature.^{21,30,40,41} Reoperations in these young patients are associated with significant morbidity, including both profound physical and psychological consequences. If subcutaneous mastectomy is selected as the surgical treatment of choice, careful preoperative counseling and thorough documentation is of paramount importance.

Although a variety of medical treatments have been attempted, including several hormone-modulators (e.g., tamoxifen, medroxyprogesterone, danazol, and bromocriptine), results are suboptimal.^{24,25,31,41-44} At best, these treatments may lead to breast growth arrest, without observation of size reduction or symptom alleviation. Case reports of postoperative prevention of breast growth with tamoxifen have been published.^{40,45} Variable dose regimens of tamoxifen citrate

have been used for this purpose.^{40,41,45} O'Hare et al⁴⁵ have observed growth stabilization with 20 mg of tamoxifen citrate for 6 months. In other cases, breast growth has been reported after 4 months of pharmacotherapy, despite titrating tamoxifen to doses as high as 40 mg daily.⁴¹ Higher doses of these medications should be used with extreme caution as these medications present significant side effects. For example, side effects of tamoxifen include endometrial hyperplasia, hot flashes, venous thromboembolism, and bone density changes.⁴⁶ Outcomes of high doses and long-term use of these medications in the adolescent population are unknown.

Breastfeeding and Nipple Sensation Following Reduction Mammoplasty

When discussing reduction mammoplasty with adolescents and their parents or caretakers, the delicate but relevant topic of postoperative breastfeeding ability and nipple sensation should be addressed. Brzozowski et al⁴⁷ studied breastfeeding in women who had children after inferior pedicle reduction mammoplasty and found that ~30% of women were able to breastfeed, 17.9% had an unsuccessful breastfeeding attempt, and 52.6% did not attempt breastfeeding at all. In a similar study, Cruz et al observed higher breastfeeding success rates following breast reduction. They reported that a majority of women (62%) with macromastia, but without prior breast surgery were able to breastfeed. Breastfeeding success rates following varying reduction mammoplasty techniques were not significantly different in this study (62%, 65%, and 64% for superior, medial, and inferior pedicle techniques, respectively).⁴⁸ Therefore, although breastfeeding is possible for most women following reduction mammoplasty, preoperative counseling should address the possible inability to breastfeed.^{49,50} During surgery, care should be taken to avoid significant resection of ductal breast tissue.⁵⁰ With regards to preservation of nipple sensation following reduction mammoplasty, Cruz et al⁴⁸ found that 2% of patients who underwent reduction mammoplasty reported impaired or complete loss of nipple sensation, regardless of the type of pedicle used.

The choice of surgical technique depends on surgeon and patient preference, and should be tailored to patient body habitus, breast shape, and size. The surgeon must decide on (1) the pattern of skin resection, and (2) the type of pedicle. With regards to skin resection, reduction mammoplasty using the Wise pattern, resulting in an inverted-T scar, may be reserved for larger reductions and/or with significant skin excess.⁸ Vertical scar techniques may be used for moderate breast reduction.^{50,51} Regardless of the pattern of skin resection selected, efforts should be made to minimize scars; long, visible scars serve as a constant reminder of the patient's former deformity and torment.⁴⁹ Several types of dermoglandular pedicles have been described for reduction mammoplasty. In the United States, the Wise pattern of skin resection and inferior pedicle remain the most popular breast reduction technique used by plastic surgeons.⁵² In recent years, superior and superomedial pedicle breast reduction techniques have slowly gained in popularity, both in adolescent and adult reduction mammoplasty.⁵³⁻⁵⁷ The superior

and superomedial pedicle approaches tend to preserve projection and breast shape as they rely less on the skin brassiere to hold the breast shape, when compared with inferior pedicle techniques.⁵⁷

Although the chances of finding a malignancy are low, surgical breast resection specimens should be sent for histopathological evaluation. Pathologically, adolescent breast tissue usually consists of normal stromal and ductal tissue with variable amounts of fat.¹⁸

Outcomes and Prognosis

Reduction mammoplasty is generally well tolerated by adolescents with macromastia or juvenile breast hypertrophy, both from a physical and psychological perspective.^{6,13,58} Almost immediate relief of physical symptoms is commonly observed, which positively influences physical and psychological outcomes. Studies have demonstrated that the procedure may improve disordered eating behaviors and markedly enhance self-perceived body image.^{6,32,36,37,59-68} Following reduction mammoplasty, adolescents tend to resume physical and social activities that were previously avoided, thus positively impacting quality of life.^{10,13} Although some patients present varying degrees of breast tissue regrowth in the decades following reduction mammoplasty, usually following events such as weight variations and pregnancy, symptomatic relief and high patient satisfaction have been demonstrated, with few reports of decision regret.¹³ Women who underwent reduction mammoplasty as adolescents report high satisfaction levels maintained throughout adulthood.^{7,9} In the case of virginal (or juvenile) breast hypertrophy, outcomes data are scarce as most available data are limited to small case series or anecdotal reports.⁴³

Conclusion

Just as adults with macromastia experience physical and emotional distress, teenagers with breast hypertrophy, especially those with juvenile (or virginal) hypertrophy, may suffer equal or greater anguish. This makes them particularly vulnerable to long-lasting medical and psychological sequelae. A multidisciplinary team needs to carefully evaluate adolescents consulting for hyperplastic breast disorders. Health care providers must be aware of the negative physical and psychological health outcomes associated with these conditions. In conjunction with lifestyle improvements, reduction mammoplasty is known to be a safe and effective treatment for teenagers suffering from macromastia. In the case of juvenile (or virginal) breast hypertrophy, further investigation is warranted to define the underlying etiology and best management guidelines. Currently, surgery alone, or in combination with hormonal therapy, may help alleviate symptoms.

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