

# Breast Asymmetry during Adolescence: Physiologic and Non-Physiologic Causes

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**ABSTRACT:** **Background:** Pathologic breast conditions are rare in childhood and adolescence. The spectrum of breast disease in the pediatric age group is different from that in adults, and most lesions are benign

**Objectives:** To describe the causes and characteristics of breast asymmetry in adolescents with normal endocrine profiles and sexual development.

**Methods:** The files of patients with a diagnosis of breast asymmetry referred to a tertiary pediatric center from 1990 to 2007 were reviewed for history and findings on physical examination with or without imaging, treatment and outcome.

**Results:** Eleven patients aged 12.5 to 18 years were identified. The cause of the breast asymmetry was traced to unpreventable medical factors in eight patients (physiologic, Poland anomaly, scleroderma), preventable/iatrogenic factors in two patients (chest tissue biopsy, thoracic drain), and possible combined medical-iatrogenic factors in one patient (scoliosis treated with a body brace). All patients were referred for breast reconstruction after full breast development.

**Conclusions:** Severe breast asymmetry in adolescence may be due to congenital factors, diseases involving the breast tissue, or to the effects of medical treatment, and may have severe adverse psychological and social implications. To prevent iatrogenic breast asymmetry, physicians should be made aware of the sensitivity of the breast tissue and should avoid unnecessary tests/procedures that involve the chest wall. In most cases a precise medical history and physical examination can differentiate between physiologic and non-physiologic causes.

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**KEY WORDS:** breast asymmetry, linear scleroderma, scoliosis, Poland anomaly, iatrogenic cause, physiologic cause

During embryogenesis, the breast develops from epidermal cells that migrate to the mesenchymal tissue during week 6. Postnatal breast growth in girls normally begins between the ages of 8 and 13 (average 11–11.5 years) and extends over a period of 2–4 years after thelarche [1,2]. Mean age at onset of breast development is 8.8 years in Afro-American girls and 10.2 years in Caucasian girls [3].

In some cases, one breast develops more rapidly than the other [1,2], leading to an asymmetry in the shape, volume or position of the breasts or the nipple-areola complex. The asymmetry usually attenuates with time and eventually disappears [4-6]. In the minority of cases, the cause can be traced to an underlying condition or previous medical procedure.

The spectrum of pathologic breast conditions in children and adolescents differs from that of adults. Malignant lesions are very rare and, when present, are usually due to metastases of rhabdomyosarcoma, leukemia, lymphoma and neuroblastoma, and their ultrasound appearance is non-specific [7]. The main primary malignant breast tumor in adolescents is cystosarcoma phylloides.

The aim of the present study was to investigate the causes, characteristics, and outcome of breast asymmetry in adolescents with a normal endocrine profile and normal sexual development. We reviewed the relevant literature.

## PATIENTS AND METHODS

The computerized database of a major tertiary pediatric medical center was searched for all patients evaluated for breast asymmetry from 1990 to 2007. Data were collected on patient characteristics, medical history, diagnosis, physical findings, imaging findings, treatment and outcome. In each case a specific cause or underlying factor was sought. The study was approved by the Institutional Review Board of Schneider Children's Medical Center of Israel

## RESULTS [TABLE 1]

Eleven patients with breast asymmetry, all girls, met the study criteria. Ages ranged from 12.5 to 18 years. Causes of breast asymmetry were categorized as physiologic, congenital, disease related, iatrogenic, and other.

**B**reast development is an important marker of the transition to adulthood. Any aberration in this process may cause adolescents to feel self-conscious and to have poor self-esteem [1].

**Table 1.** Eleven patients with breast asymmetry in adolescence

| Diagnosis                            | No. of patients | Gender/age (yrs) | Findings on physical exam                 |
|--------------------------------------|-----------------|------------------|---|
| Physiologic asymmetry                | 2               | F/15,18          | No palpable mass                          |
| Poland syndrome                      | 5               | F/16,16,17,17,18 | Hypoplastic breast and scoliosis (1 case) |
| Linear scleroderma                   | 1               | 12.5             | Atrophic line at midline                  |
| Iatrogenic                           |                 |                  |   |
| Breast biopsy (at age 2 yrs)         | 1               | F/16             | Distorted breast                          |
| Thoracic drainage                    | 1               | F/16             | Distorted breast                          |
| Unclear (scoliosis or brace induced) | 1               | F/16             | Scoliosis                                 |

**PHYSIOLOGIC BREAST ASYMMETRY (2 CASES)**

Of the 11 patients, 2 (age 15 and 18 years) presented with complaints of a noticeably large left breast compared to the right breast since the start of breast development. No palpable masses were detected and the rest of the physical examination was non-contributory. Findings on ultrasonography of the breasts and pectoral muscles in the 15 year old were normal. In both patients the diagnosis was physiologic breast asymmetry. The 15 year old was advised to undergo breast reconstruction after full breast development. The 18 year old underwent successful reconstruction.

**CONGENITAL BREAST ASYMMETRY (5 CASES)**

Five patients had congenital breast asymmetry. The first, aged 17, reported regular menarche since age 13 years. Physical examination revealed achievement of full puberty. The right breast was prominently hypoplastic with poor development of the nipple and areola; the left breast was fully developed. The right pectoralis major muscle was also hypoplastic. The remainder of the examination was unremarkable. Ultrasonography showed no masses in the left breast and marked hypoplasia of the right pectoralis muscle. There was no difference between the upper limbs. The diagnosis was Poland syndrome and the patient was referred for left breast augmentation, with good results.

The second patient was a 16 year old girl who had been followed in the Department of Orthopedics for idiopathic scoliosis. Treatment with a plastic brace starting at age 12 was followed 4 years later by spinal fusion of the T4-L1 vertebrae. Soon afterwards, the patient presented with complaints of a left hypoplastic pectoralis muscle and left hypoplastic breast, nipple and areola. No other anomalies were found. Breast augmentation was performed successfully at age 18. Given the severity of the findings we assumed that the main cause was Poland syndrome and that the contribution of the scoliosis was secondary.

Three additional patients – aged 16, 17 and 18 – presented with unilateral breast hypoplasia and pectoralis muscle aplasia. No scoliosis or other anomalies were detected on physical examination. All were referred for breast augmentation.

**Figure 1.** Girl with linear scleroderma at the midline of the left hypoplastic breast**DISEASE-RELATED BREAST ASYMMETRY (1 CASE)**

A 12.5 year old girl presented with maldevelopment of the right breast due to an atrophic line at the midline [Figure 1]. At age 11 years she had been referred for evaluation of linear scleroderma of 4 months duration. Her history was unremarkable. Physical examination revealed linear induration atrophy and hyperpigmentation of both arms and several plaques of morphea on the right shoulder and breast with contractures of the proximal and distal interphalangeal articulations of the left hand. Treatment consisted of penicillamine, colchicine, and a short course of oral corticosteroids. Pubertal development at the time was Tanner stage II. The patient underwent plastic reconstruction of the right breast at age 18 but was lost to follow-up.

**IATROGENIC BREAST ASYMMETRY (2 CASES)**

A 16 year old girl with complaints of breast asymmetry had a medical history of open biopsy of the left breast at age 2 years for a “breast mass” that regressed 6 months later. Physical examination revealed Tanner stage IV for breast development and pubic hair. The left breast was distorted at the site of the biopsy, with partial absence of the lower median breast tissue. The areola was normal. No masses were palpable. The patient was sent for plastic reconstruction when full puberty was reached.

The second case of iatrogenic breast asymmetry involved a 13 year old girl born at 25 weeks gestation with a birth weight of 900 g. In the Neonatal Intensive Care Unit she had undergone thoracic drainage for hyaline membrane disease complicated by right pneumothorax. Growth was normal. Physical examination at the current presentation revealed Tanner stage IV. The right breast was small and distorted, with a large scar and lack of mass in the lateral region. The nipple and areola were normal. Plastic reconstruction on completion of puberty was recommended.

**BREAST ASYMMETRY OF UNCLEAR CAUSE (1 CASE)**

A 16 year old girl with breast asymmetry had been treated for scoliosis from age 12 to 14. She mentioned that the strips of the plastic brace passed over her left breast. At the time of treatment she already showed significant pubertal signs. Physical examination revealed that the left breast was about one-third the volume of the right one. It was unclear whether the atrophy was caused by the scoliosis or the mechanical stress of the strips, or both. The patient was sent for breast augmentation on completion of breast development and was lost to follow-up.

**DISCUSSION**

The mammary glands develop in the sixth week of embryogenesis as solid extensions of the ectoderm into the underlying mesenchyme. These extensions occur along two thickened strips of ectoderm, which start at the axilla and extend to the inguinal region. Later in fetal life, the mammary ridges disappear except in the pectoral area. The breast bud, the pectoral remnant of the mammary ridge, consists of primary ducts and loose stroma. Secondary lactiferous ducts arise from the primary ducts. Each ductal system drains independently into the nipple. At gestational age of about 40 weeks, the nipples are poorly formed and often depressed. Around the perinatal period, connective tissue grows under the breast bud to form the nipple/areola complex [2,3].

Breast size discrepancy can be a disturbing cosmetic problem with an adverse impact on quality of life, particularly in adolescents who are just starting sexual relationships. It can cause considerable embarrassment and disturbed body image and can lead to feelings of social unacceptance and lack of self-esteem and self-confidence. Some girls even withdraw completely from social contact. Depression is often an accompanying symptom [2,4].

Most cases of breast asymmetry during puberty are believed to be physiologic. The diagnosis can usually be reached by a carefully recorded medical history and physical examination. When taking the medical history, the clinician should address possible traumatic procedures, use of braces, and systemic symptoms and signs associated with disease-related breast asymmetry. The physical examination should focus on the presence of other skeletal anomalies, scoliosis, and the typical appearance of skin in linear scleroderma. Ultrasound also serves as a good auxiliary tool in suspected cases to rule out inflammatory lesions (such as abscess), benign neoplastic lesions (fibroadenoma), and secondary and primary lesions (cystosarcoma, the most common primary breast malignancy in adolescents) [7]. If no abnormal findings are noted with these measures, the patient and parents may usually be reassured that the asymmetry will become less noticeable with age. However, if significant asymmetry persists after full breast development, augmentation or reduction mammoplasty may be considered

[2]. Invasive procedures should always be delayed until breast development is complete. This should be carefully determined by the clinician, given the variability among individuals in breast growth. Helpful clues include patient or family history and no change in bra size during the previous year [8].

Although annual mammography screening provides a mortality benefit in adults [9], it is contraindicated in children because of their extremely low risk of breast cancer [1] and the dense fibroglandular nature of the young breast tissue, which poses an increased risk of radiation-induced malignant changes [2] and poor image quality [2,7,9].

In the present series, only 2 of the 11 patients had physiologic breast asymmetry. This low proportion may be due to the possibly low rate of referral of cases of physiologic breast asymmetry to major medical centers. It is also possible that physiologic breast asymmetry is often not identified as a distinct diagnostic entity.

One pathologic cause of breast amastia is Poland syndrome, a rare non-genetic congenital anomaly [5,10,11] and the major cause of breast asymmetry in the present series (5 of 11 patients). Poland syndrome is characterized by hypoplasia of the breast and nipple, scarcity of subcutaneous tissue, absence of the costosternal portion of the pectoralis major muscle, lack of the pectoralis minor muscle, aplasia or deformity of the costal cartilages or ribs II to IV or III to V, alopecia of the axillary and mammary region, and unilateral brachysyndactyly. The extent and involvement of these components vary and it is rare for all features to be present in the same individual. There is no correlation among the extent of hand, breast and thoracic deformities. The risk of recurrence in the same family is low. According to the prevailing theory, the syndrome is due to an interruption of the embryonic blood supply at the end of the sixth week of gestation, when the upper limb bud adjacent to the chest wall is still in a stage of development, leading to hypoplasia of the ipsilateral subclavian artery or one of its branches. Support for this assumption was provided by findings of a decrease (~50%) in the diameter of the subclavian artery in affected patients and low flow velocity. The site and degree of flow impairment are apparently related to the extent and severity of the anomaly. Hypoplasia of the internal thoracic artery could cause the absence of the sternocostal portion of the pectoralis major muscle, whereas hypoplasia of the brachial artery may cause the hand abnormalities [4,12,13].

Juvenile localized scleroderma is an uncommon autoimmune disease affecting mainly Caucasian females. It has been etiologically related to environmental factors such as mechanical events (67%), infections (25%), drugs (5%), and psychological distress. In a multicenter study of 750 patients with juvenile localized scleroderma, 13.3% reported specific stressful events very close to disease onset [14]. In adults, morphea attributed to local irradiation has been described [14]. However, only a few cases of breast deformity have been reported in association with

juvenile localized scleroderma [15-18]. In the present series, it was identified in 1 of 11 patients with breast asymmetry.

Other diseases involving the breast tissue have been described in the literature, including fibroadenoma, cystadenoma phyllodes cysts, lipoma hemangioma, and abscesses [5]. None of the present cases was attributed to these causes.

The rate of breast asymmetry is higher in girls with scoliosis than in the general population [19]. However, the unequal breast size is usually an illusion induced by the scoliosis or rib cage defect (pseudoasymmetry). However, in adolescent girls with progressive right-convex thoracic scoliosis, the breast asymmetry may also be due to a developmental abnormality in the arterial blood supply to the chest wall [20]. In these cases, the condition precedes the treatment and is therefore not attributable to it. Sometimes, the therapeutic braces induce local trauma to the breast tissue and cause breast hypoplasia. In one patient in our series, it remained unclear whether the breast asymmetry was due directly to her scoliosis or occurred secondary to placement of the braces.

Breast asymmetry may be associated with premature telarche, a transient condition of isolated breast development that most often appears in the first 2 years of life; it may be unilateral or bilateral. The genitals show no evidence of estrogenic stimulation. The breast development is rarely progressive, and menarche occurs at the expected age. Recently, there have been more and more reports of puberty and telarche already at age 6–7 years, related to a high body mass index [21]. In this setting, clinicians should bear in mind that a breast bud palpated as a small mass can be the first sign of puberty. Unnecessary removal of tissue or fluid from the developing breast in young and preadolescent children, even by needle aspiration, for evaluation of suspected tumor can cause breast distortion and hypoplasia [22] and should therefore be considered with extreme caution. In our series, two patients had iatrogenic breast asymmetry secondary to breast biopsy performed at age 2 years and thoracic drainage performed in infancy.

Accordingly, breast asymmetry has frequently been reported as a postoperative complication of esophageal atresia repair, thoracotomy for tracheoesophageal fistula, and anterolateral thoracotomy for correction of simple congenital cardiac defects [22-25]. Thoracostomy insertion may also cause breast damage [2].

In summary, pediatricians and family physicians must be aware that breast development is very often asymmetric at the beginning of puberty. In most cases, the condition is benign and resolves with time. Some cases of significant asymmetry may be impossible to prevent, such as those due to Poland syndrome or scleroderma induration. Those that can be traced to iatrogenic causes require special consideration. Physicians must be alert to the sensitivity of the breast tissue during infancy and should perform invasive procedures only when absolutely necessary and with great caution. Surgical

procedures to correct breast asymmetry in adolescence should be delayed until breast development is completed.

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