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Prevalence of Breast Fibroadenoma in Adolescent Girls. A Clinical Observation Based on Ultrasound Examination

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Abstract

This article examines the clinical features of fibroadenoma of the breast in adolescent girls and analyzes the changes in the tumor during different phases of the menstrual cycle based on ultrasound (US) findings. It provides a characterization of the tumors, their morphological types, the frequency of detection depending on age, and evaluates the relationship between endocrine disorders and the formation of fibroadenomas. Special attention is given to the role of sex steroid hormones, primarily hyperestrogenic stimulation, as a key factor in the development of these lesions.

Keywords: fibroadenoma of the breast; adolescent girls; benign tumor; ultrasound examination; menstrual cycle; hormonal imbalance; hyperestrogenism; juvenile fibroadenoma; endocrine disorders; breast; US diagnostics.

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Introduction

Fibroadenoma is the most common benign tumor of the breast in women, including adolescent girls. In most patients, the tumor presents as a solitary nodule up to 3 cm in diameter. Breast fibroadenoma (FA) develops from both stromal and epithelial (ductal) components and is characterized by a predominance of connective tissue stroma over glandular parenchyma. The exact causes of fibroadenoma development remain unclear; however, a leading role is attributed to hormonal imbalance and increased sensitivity of breast tissue to sex hormones[1].

Methodology

The present study employs a clinical observational and analytical research design to investigate the prevalence and characteristics of breast fibroadenoma in adolescent girls, with a particular focus on ultrasound-based diagnostics and hormonal influences. The research is based on the analysis of clinical data obtained from adolescent patients who underwent ultrasound examination of the breast at a specialized medical institution. The study population includes patients in the pubertal age group, allowing for the evaluation of age-related and endocrine factors associated with fibroadenoma development. Ultrasonography serves as the primary diagnostic method due to its safety, non-invasiveness, and high informativeness in assessing dense breast tissue typical of adolescents. During the examination, key parameters such as lesion size, shape, echogenicity, contour clarity, internal structure, and localization relative to surrounding tissues were systematically evaluated. In addition, a dynamic observation approach was applied to monitor changes in fibroadenoma characteristics across different phases of the menstrual cycle, including the follicular, ovulatory, and luteal phases, in order to assess the influence of hormonal fluctuations on tumor behavior. The study also incorporates a comparative analytical method to examine morphological types of fibroadenoma, including intracanalicular, pericanalicular, and mixed forms, as well as juvenile variants characterized by rapid growth. Furthermore, elements of clinical correlation were used to evaluate the association between ultrasound findings and endocrine disorders such as ovarian dysfunction, thyroid abnormalities, and hyperprolactinemia. The integration of observational, diagnostic, and analytical methods ensures a comprehensive assessment of fibroadenoma characteristics, enabling a deeper understanding of its pathogenesis, clinical course, and diagnostic features in adolescent patients[2].

Result and Discussion

Epidemiology and Age Characteristics

Breast fibroadenoma is one of the most common tumor-like formations during adolescence, accounting for up to 30–50% of all detected benign breast lesions in girls. The peak incidence occurs during puberty, when significant hormonal changes necessary for the development of the reproductive system take place[3].

Table 1: Fibroadenoma

Adolescence is the most vulnerable period for the development of fibroadenomas, as during this time breast tissue is particularly sensitive to estrogen, progesterone, and prolactin. The growth and differentiation of glandular tissue correspond to fluctuations in hormone levels, which promotes the development of proliferative processes[4].

Morphological Features

Fibroadenomas arise from the cells of the terminal duct-lobular unit. The tumor does not have a true capsule, but it often appears as a well-circumscribed nodule. Histologically, two main types of stromal proliferation are distinguished:

Intracanalicular type, in which connective tissue grows into the lumens of the ducts (characterized by a heterogeneous structure and a soft, loose consistency)

Pericanalicular type, in which the stroma surrounds the ducts without deforming them (characterized by well-defined borders, a firm elastic consistency, and high mobility)[5].

In some cases, a mixed form is observed.

The size of most fibroadenomas does not exceed 3 cm. However, when the lesion increases to more than 5 cm, has a mass exceeding 500 g, or replaces more than 80% of the breast tissue, the term “giant fibroadenoma” is used. If the tumor demonstrates rapid growth that outpaces normal developmental rates, it corresponds to a juvenile fibroadenoma, which is characteristic specifically of adolescents.

Pathogenesis and the Role of Hormonal Factors

Puberty is a period of intense hormonal restructuring of the body. Changes in the levels of estrogen, progesterone, prolactin, and gonadotropins promote active proliferation of epithelial and stromal structures of the breast[6].

Key pathogenetic mechanisms:

Hyperestrogenic stimulation — the main factor in the development of fibroadenoma;

Increased sensitivity of breast tissue receptors to estrogens;

Progesterone deficiency, which enhances proliferative processes;

Dysregulation of cell growth associated with endocrine disorders.

Endocrine disorders commonly associated with fibroadenoma development:

Ovarian dysfunction;

Thyroid diseases;

Polycystic ovary syndrome;

Menstrual cycle disorders;

Hyperprolactinemia.

In these conditions, the balance between estrogen and progesterone is altered, creating a favorable environment for the proliferation of breast tissue[7].

Ultrasound Diagnosis and the Role of Ultrasound in Adolescents

Ultrasound is the leading imaging modality for evaluating the breast in adolescents, as the dense structure of breast tissue at a young age makes mammography less informative. Ultrasound examination is safe, highly informative, and allows for a detailed assessment of breast tissue.

Ultrasound enables evaluation of:

Lesion size;

Structure and echogenicity;

Clarity of contours;

Location relative to the skin and ducts;

Changes over different phases of the menstrual cycle.

Fibroadenomas are sensitive to hormonal fluctuations and may change in size and density throughout the menstrual cycle[8].

Cyclical Changes of Fibroadenoma

Follicular phase (from the beginning of menstruation to ovulation):

The dominant hormone is estrogen. The fibroadenoma usually remains stable in size. During this period, the breast is generally less tense, so the lesion may even appear smaller..

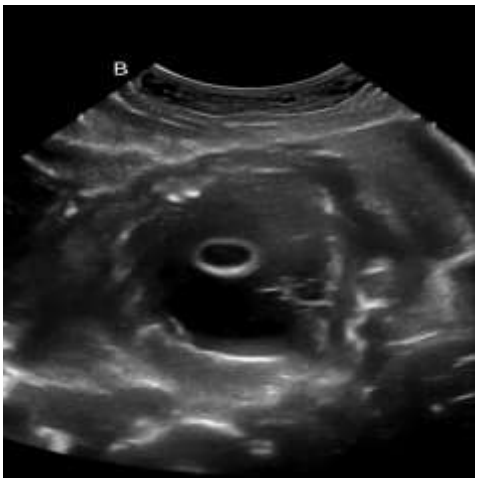

Table 2: Follicular phase

- Ovulation:

Estrogen levels peak, followed by a rise in progesterone.

Possible changes include slight enlargement of the fibroadenoma and increased breast sensitivity[9].

Table 3: Ovulation phase

• Luteal phase:

Progesterone levels increase, and this is when the following changes may occur:

Tissue densification and a possible increase in fibroadenoma size;

Fluid retention and swelling of breast tissue[10].

Table 4: Luteal phase

After menstruation ends, the size of the fibroadenoma typically decreases again[11].

To clarify the growth pattern, a physician may recommend monitoring over 1–2 menstrual cycles.

Ultrasound Features of Fibroadenoma

On ultrasound, a fibroadenoma is typically visualized as:

An oval or round hypoechoic lump;

Well-defined, smooth contours;

Homogeneous internal structure;

Orientation with the long axis parallel to the skin;

No signs of infiltration into surrounding tissues[12].

Juvenile (Giant) Fibroadenoma

Juvenile fibroadenoma is a distinct form that occurs mainly in adolescents. Its characteristic features include:

Rapid growth over a short period of time;

Large size of the mass;

Possible deformation of the breast;

Dilation of subcutaneous veins due to skin stretching[13].

Table 5: Juvenile fibroadenoma

The tumor is usually benign but requires careful monitoring because of its rapid enlargement[14].

Morphological Types of Fibroadenoma

Intracanalicular type — the stroma proliferates into the milk ducts;

Pericanalicular type — the stroma surrounds the ducts;

Mixed type — combines features of both;

Phyllodes (leaf-like) tumor — a rare form characterized by rapid growth and a potential risk of malignant transformation, requiring special attention and monitoring[15].

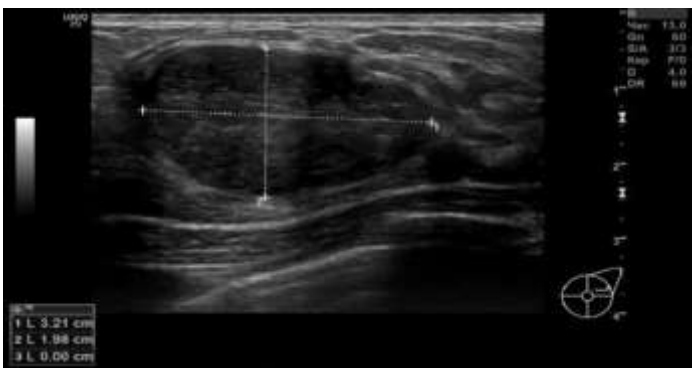

Table 6: Phyllodes (leaf-like) tumor

Conclusion

Breast fibroadenoma is the most common benign tumor in adolescent girls and is closely associated with the hormonal changes of puberty. A leading role in its pathogenesis is played by hyperestrogenic stimulation, increased sensitivity of breast tissue receptors to sex hormones, and endocrine disorders that promote proliferative processes.

The clinical and ultrasound characteristics of fibroadenoma have typical features that allow for reliable differential diagnosis. Ultrasound examination is the primary imaging modality, providing a safe and

informative assessment of the lesion's structure, size, and dynamic changes, including variations across different phases of the menstrual cycle.

Particular attention should be given to juvenile forms of fibroadenoma, which are characterized by rapid growth and may lead to breast deformity, necessitating dynamic monitoring and timely follow-up.

Thus, early diagnosis, regular ultrasound monitoring, and assessment of hormonal status allow for timely detection of changes and reduction of potential complications. A comprehensive approach to managing adolescent patients helps optimize follow-up strategies and improve clinical outcomes.

Future research perspectives are associated with a deeper understanding of the hormonal and molecular mechanisms underlying fibroadenoma development, as well as the development of more effective diagnostic and monitoring approaches for this patient group.

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