

ULTRASOUND BREAST MORPHOTYPES IN ADOLESCENT GIRLS

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ABSTRACT

Introduction. The knowledge of normal ultrasound (US) breast morphology is essential for any radiologist according to diagnostic and prognostic positions. In contemporary scientific literature, only US breast morphotypes of reproductive age women are described. Nevertheless, radiologists often experience numerous diagnostic difficulties with pubertal and adolescent patients in differentiating normal and pathological changes in the breast. The aim of this study was to analyze normal types of breast echo structure (US breast morphotypes) and to determine the diagnostic criteria for the differentiation of breast morphotypes in adolescent girls.

Methods. The study population consisted of 241 girls between 13 and 17 years of age, who were examined clinically, including standardized sonography (7.5–13 MHz, conventional B-mode sonography). In the investigated group there were persons whose sexual development was appropriate to their age, who had no abnormalities of reproductive organs and menstrual dysfunctions and who claimed that they had no sexual contacts and did not use oral contraception.

Results. Unexpectedly, in adolescent girls all US breast morphotypes typical of different periods of female ontogenesis were found: the juvenile morphotype – the “early reproductive” morphotype – the “reproductive prime” morphotype – the “reproductive maturity” morphotype – the premenopausal morphotype – the postmenopausal morphotype. We consider the main criterion of US breast morphotype diagnostics to be the progressive increase of the volumetric density of the fat lobules within glandular tissue. A gradential increase of the thickness of pre- and retromammary fat layers is the second criterion of morphotype diagnostics.

Conclusions. Under normal conditions of mammogenesis in adolescent girls it is possible to find a wide spectrum of US breast morphotypes. When postmenopausal

and premenopausal morphotypes are found in ultrasound examination of the breast in adolescent girls, it could be qualified as a normal development of the breast.

Key words: breast, ultrasound, morphotype, echo structure.

INTRODUCTION

The knowledge of normal ultrasound (US) breast morphology is essential for any radiologist according to diagnostic and prognostic positions [1, 4, 5]. In contemporary scientific literature only US breast morphotypes of reproductive age women are described [7]. Nevertheless, radiologists often experience numerous diagnostic difficulties with pubertal and adolescent patients in differentiating normal and pathological changes in the breast [2, 3, 6]. The aim of this study was to analyze normal types of breast echo structure (the US breast morphotypes) and to determine the diagnostic criteria for the differentiation of breast morphotypes in adolescent girls.

MATERIAL AND METHODS

The study population consisted of 241 girls between 13 and 17 years of age, who were examined clinically, including standardized sonography (7.5–13 MHz, conventional B-mode sonography). In the investigated group there were included persons whose sexual development was appropriate to their age, who had no abnormalities of reproductive organs and menstrual dysfunctions and who claimed that they had no sexual contacts and did not use oral contraception.

RESULTS

We have marked out several types of breast echo structure and diagnostic criteria for their determination.

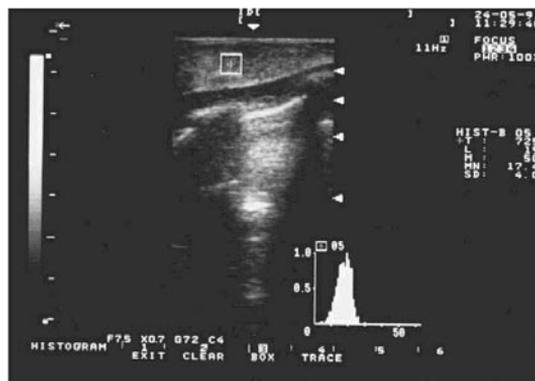


Fig. 1. The juvenile morphotype. The echostructure of the breast consists of an entire layer of fibroglandular stroma with a small grained design. There is no premammary and retromammary fat tissue.

The juvenile morphotype. In patients having the juvenile morphotype the echo structure of the breast consists of an entire layer of fibroglandular stroma with a small grained design. The echogenicity of fibroglandular stroma is high. The thickness of the glandular layer does not exceed 15 mm. The echo structure is similar in all the quadrants of the breast. There is no premammary and retromammary fat tissue (Fig. 1).

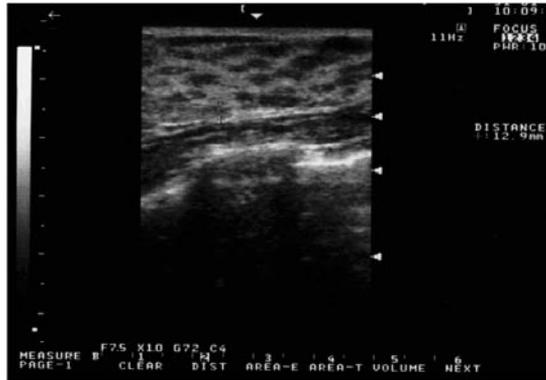


Fig. 2. The “early reproductive” morphotype. The breast echostructure is presented by an entire layer of glandular tissue with a distinctive small porous design. Retromammary fat tissue is absent. Premammary tissue is presented by small elongated fragments of fat.

The “early reproductive” morphotype. The echo structure of the breast is presented by an entire layer of glandular tissue with a distinctive small porous design. The echogenicity of glandular tissue is smaller than the echogenicity of glandular stroma in the juvenile morphotype. Retromammary fat tissue is absent. Premammary tissue is often absent or is represented by small elongated fragments of fat (Fig. 2).

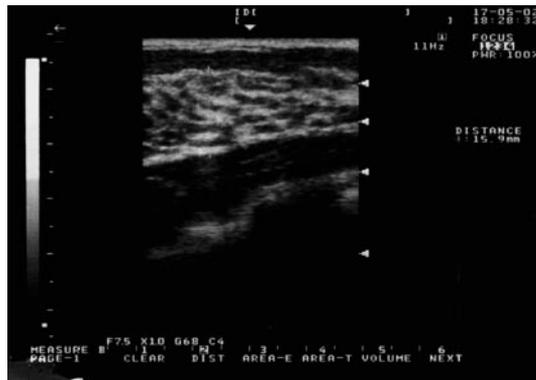


Fig. 3. The “reproductive prime” morphotype. The breast echo structure is presented by two layers – glandular tissue and premammary fat. The thickness of the premammary layer is smaller than the thickness of glandular tissue. Retromammary fat tissue is absent.

The “reproductive prime” morphotype. The echo structure of the breast is presented by two components – glandular tissue and fat. Glandular tissue forms a basic part of the breast. It has a porous design with small hypoechoic “spots” of fat. Premammary fat tissue is presented by an entire layer of hypoechoic fat tissue. The thickness of the premammary layer in all cases is smaller than the thickness of glandular tissue. Retro-mammary fat tissue is absent (Fig. 3).

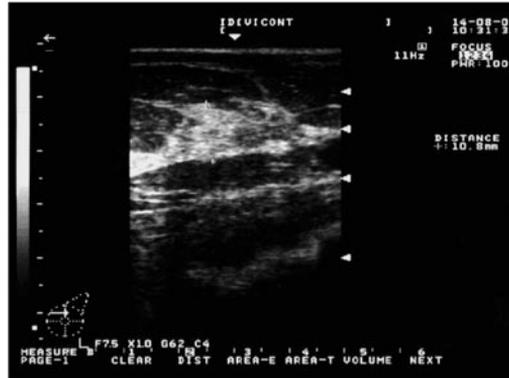


Fig. 4. The “Reproductive maturity” morphotype. There are three distinctive layers in the breast tissue: premammary fat, glandular tissue and retromammary fat layer.

The “reproductive maturity” morphotype. The thickness of the premammary fat layer is comparable with the thickness of glandular tissue. There are a lot of fat lobules, ranging from 5 to 15 mm, inside the glandular layer. In glandular tissue there are multiple hyperchoic linear stromal fibers. Retromammary fat tissue is an obligatory attribute of this morphotype. The thickness of the retromammary fat layer is comparable with the glandular layer and the premammary fat layer (Fig. 4).



Fig. 5. The premenopausal morphotype. Glandular tissue consists of multiple large fat lobes (defined by the markers).

The premenopausal morphotype. The diameter of fat lobules inside glandular tissue achieves 15–20 mm. Premammary and retromammary fat tissue lose signs of a layer and look like a multitude of large fat lobules. That is why it is difficult to distinguish separate layers of fat and glandular tissue in the premenopausal morphotype (Fig. 5).

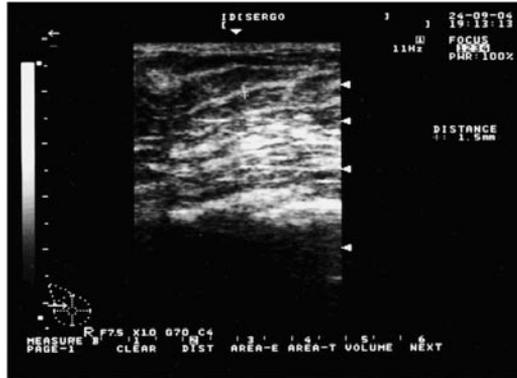


Fig. 6. The postmenopausal morphotype. The breast tissue is presented by the layer of fat with small glandular “islets”.

The postmenopausal morphotype. The tissue of the breast consists of large fat lobes which look like spherical hypoechoic structures. Sometimes it is possible to distinguish small hyperechoic glandular “islets” within the fat. There is no stratified echo structure in the breast (Fig. 6).

DISCUSSION

We consider the main criterion of US breast morphotype diagnostics to be the progressive increase of the volumetric density of the fat lobules within glandular tissue. A gradiental increase of the thickness of pre- and retromammary fat layers is the second criterion of morphotype diagnostics.

During different periods of female ontogenesis radiologists could observe a whole range of breast US morphotypes [6, 7]:

The juvenile morphotype – the “early reproductive” morphotype – the “reproductive prime” morphotype – the “reproductive maturity” morphotype – the premenopausal morphotype – the postmenopausal morphotype (Fig. 7).

The “lactating” morphotype and the morphotype of pregnancy are absent from the scale because they could be placed practically in each point of the scale.

It was an unexpected result that all the morphotypes were found in girls of the second pubertal phase and in adolescents. We suggest there are two ways of mammogenesis in puberty. The first way of mammogenesis is the formation the breast from the stromal and glandular tissue (the juvenile morphotype). Gradually, the development of stromal and glandular source leads to the formation of the early

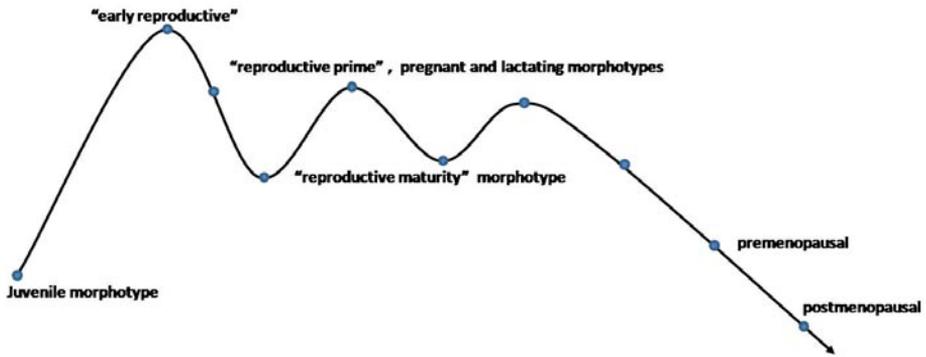


Fig. 7. The ontogenetic scale of female US breast morphotypes.

reproductive morphotype, then to the “reproductive prime” morphotype and to the “reproductive prime” morphotype.

The second way of the breast development proceeds initially predominantly from the fat tissue. The stromal and glandular source is presented in the fat tissue of the developing breast only as small “islets” (the postmenopausal morphotype). A gradual development of glandular tissue islets leads to the formation of an entire glandular layer (the “reproductive maturity” morphotype).

CONCLUSIONS

Under normal conditions of mammogenesis in adolescent girls it is possible to find a wide spectrum of US breast morphotypes. When postmenopausal and premenopausal morphotypes are found in ultrasound examination of the breast in adolescent girls it could be qualified as a normal development of the breast.

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