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Breast Imaging

Diagnosis and imaging characteristics of a juvenile fibroadenoma in a 2-year-old patient: a case report

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ARTICLE INFO

Article history:

Received 5 October 2017
 Received in revised form 13 November 2017
 Accepted 13 November 2017
 Available online 14 December 2017

Keywords:

Breast
 Pediatric
 Mass
 Juvenile
 Fibroadenoma

ABSTRACT

Fibroadenomas are abundantly reported in the literature with several papers documenting the natural progression and clinical outcomes of thousands of cases. Juvenile fibroadenomas (also called cellular fibroadenomas) are frequently characterized by rapid growth, often described as 5–10 cm in size. They constitute approximately 7%–8% of fibroadenomas. They often measure greater than 5 cm. Pathologically, they show similar features to fibroadenomas but can resemble phyllodes. There have been few documented cases of breast masses in early childhood. Furthermore, there are scant radiology publications focused on the imaging features of juvenile fibroadenomas in patients younger than 5 years old. Our patient presented at 2 years of age with a unilateral right breast mass. Two ultrasound examinations were completed over a period of 5 months, and a magnetic resonance imaging was performed prior to surgical intervention. Eventual surgical excision yielded a final pathologic diagnosis of juvenile fibroadenoma. In this report, we will discuss the imaging and pathology of juvenile fibroadenomas, and we will address important differential considerations both from a pathologic and radiologic standpoint.

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Introduction

Breast masses in the pediatric population are uncommon. When a child presents with a breast mass, the most frequent etiologies include the following (not in order of frequency): juvenile

fibroadenoma, cystosarcoma phyllodes, complicated or simple cyst, fibrocystic change, duct ectasia, juvenile papillomatosis, and papilloma. In the appropriate clinical setting, abscesses, hematomas, and fat necrosis may also be seen. Breast malignancy in the pediatric age group is rare, with only 0.2 per 100,000 females aged 15–19 and 1.6 per 100,000 females aged 20–24 with

Competing Interests: All authors have no financial disclosures. There are no people or organizations that bias this work. There are no known conflicts of interest.

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<https://doi.org/10.1016/j.radcr.2017.11.008>

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invasive malignancy. Under the age of 14, malignancy is exceedingly rare [1]. It is also important to differentiate an actual lesion from a normal breast bud, which has both cosmetic and clinical implications [2].

There have been numerous case reports of breast masses in the pediatric and adolescent population. Fibroadenomas make up approximately 68% of breast masses in adolescents, with juvenile fibroadenomas occurring most often in late adolescence [1]. Juvenile fibroadenomas are defined as fibroadenomas presenting in the age range of 11-18 years (about 4% of fibroadenomas), and they have pathologic features of prominent cellularity of the stroma with epithelial hyperplasia [3].

Imaging of these lesions in early childhood is most commonly accomplished with ultrasound. Mammography has been shown to be unnecessary and not recommended in the pediatric age group [4]. In our case a magnetic resonance imaging (MRI) was also performed, which demonstrated a thin capsule encompassing the mass; however, MRI is not specific for differentiating fibroadenomas from differentials such as phyllodes and papillomas, mandating a tissue diagnosis. The imaging features of juvenile fibroadenomas, while nonspecific, are representative of the histopathologic process. The biopsy performed was a 14-gauge core needle biopsy and was not sufficient for diagnosis. The imaging features may explain the reason for insufficient tissue recovered during an initial core needle biopsy in this case. Surgical excision is commonly the treatment of choice in lesions measuring >2 cm in diameter [4], and this mass is no exception.

Case report

We present a case of a 2-year-old female who was first taken by her parents to an outside institution for evaluation of an enlarging nonpainful right breast mass. This was noticed by her parents as a slight asymmetric prominence of her right breast tissue. The patient's past medical history is notable for 1-week hospitalization as a neonate for pulmonary edema. She had a full-term birth without additional medical problems. She was not on any medications. Her family history is significant for polycystic ovarian syndrome (PCOS) in her mother and asthma in her father. She had no family history of breast cancer or breast-related issues. She lived with her biological parents, who are nonsmokers. Her developmental progression had been normal.

She was initially seen by her primary care provider who noted that the right breast tissue was asymmetric; however, no discrete mass was felt. During this visit, the right breast mass was described as a "nickel-sized bud." Palpation of the left breast demonstrated a normal breast bud. No imaging was performed at that time. A full laboratory evaluation was also performed for precocious puberty and was normal. No imaging was performed at the time of initial presentation.

She was monitored for 5 months by her clinician and imaged shortly before her return visit. Ultrasound showed an oval circumscribed parallel hypoechoic mass with posterior acoustic enhancement and internal vascularity (Fig. 1). The mass measured 42 × 33 × 11 mm. No distinct separation could be seen between the mass and the normal right breast bud. A normal

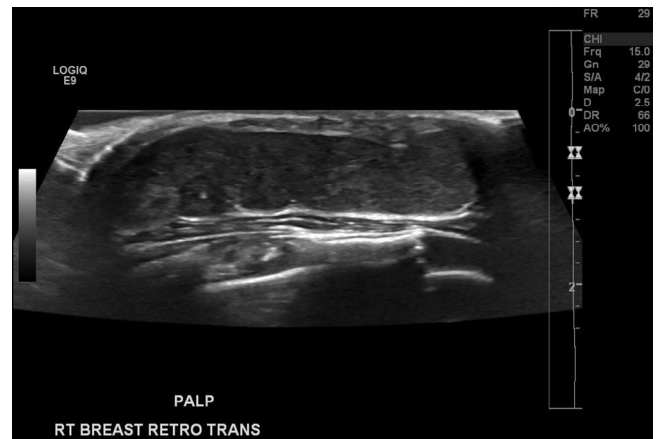


Fig. 1 – First ultrasound evaluation. Right breast ultrasound shows the palpable abnormality in the retroareolar region. Static image demonstrates a circumscribed oval hypoechoic parallel mass with posterior enhancement. No distinct separate breast bud could be seen. The mass measured 42 × 33 × 11 mm.

left breast bud was seen during this examination (images not included). Her clinical visit described the right chest now with an oblong bumpy mass, extending into the axilla, which her clinician described as a change from prior physical examination. Despite the ultrasound and changes on physical examination, the findings were still thought to possibly represent an asymmetric normal breast bud. Given the extreme young age of the patient and concern for the repercussions of intervention on the developing breast bud, another 6-month follow-up was scheduled.

The patient and family returned for the next follow-up visit, which was ultimately 11 months after the initial clinical examination. At the time of this examination, both physical and imaging characteristics of the mass had changed. Her clinician described the mass as a "mobile nodule 25 mm in diameter under the right nipple," which had not significantly changed per report; however, now there was a bluish tint to the overlying skin. Sonographically, the size remained grossly unchanged measuring 43 × 26 × 11 mm; however, the mass now appeared as mixed cystic and solid with internal septations (Fig. 2). No vascularity was demonstrated in the septations.

An MRI was then performed approximately 1 month later for further evaluation and in preparation for surgery. Multiplanar contrast-enhanced MRI was performed on a 1.5 GE scanner utilizing a combination of breath hold and respiratory triggering. T1, T2, STIR, diffusion-weighted and in-phase/out-of-phase sequences were acquired. Fat-saturation was performed as well as narrowed field of view over the right breast.

On precontrast axial T1 images, the mass showed separate hyperintense and isointense components (Fig. 3A, 3B and Fig. 4). The nonfat suppressed T1 axial images showed isointense signal throughout (Fig. 5). After the administration of IV contrast, the mass showed heterogeneous internal enhancement with nonenhancing internal septations (Fig. 4). Subtraction images and maximum intensity projection (constructed on a separate workstation using Aquarius-Net software) were also performed (Fig. 6) and allowed better visualization of the

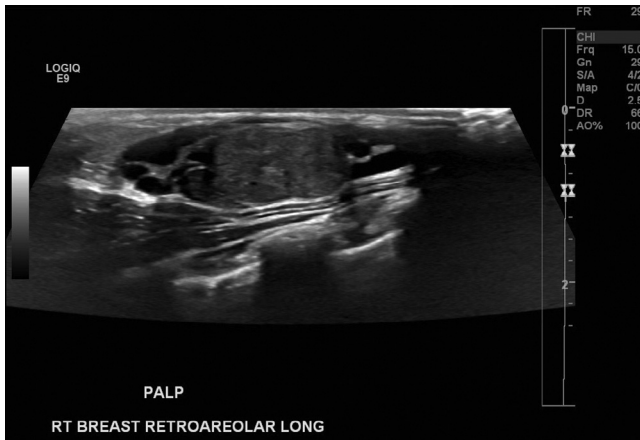


Fig. 2 – Second ultrasound examination approximately 5 months after the first ultrasound (5 months after Fig. 1). Note the new cystic spaces within the superior and inferior aspect of the mass. The mass remains oval with circumscribed margins.

heterogeneity of contrast uptake throughout the mass. Coronal T2 sequences showed varying fluid components from the superior to inferior aspects of the mass (Fig. 7). The margins of the mass appeared circumscribed on these images. The patient was referred to our institution for management of what was thought to be a hemangioma or lymphangioma.

At our institution, an ultrasound-guided core needle biopsy was first performed. Pathologic examination initially identified usual ductal epithelial hyperplasia, papillary structures, and dilation of ducts. These features are all benign and categorized as a fibroepithelial lesion. Due to limited sampling and the rarity of fibroepithelial lesions in patients of this age, expert consultation was sought and resulted in a diagnosis of “benign

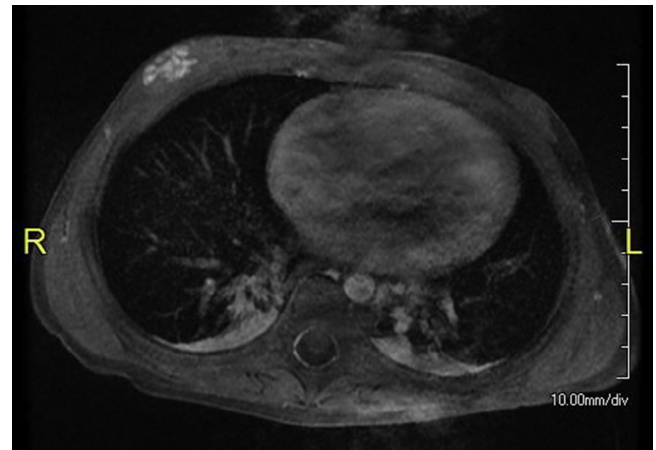


Fig. 4 – Axial postcontrast T1 with fat suppression demonstrating heterogeneous enhancement in a portion of the right breast mass. Nonenhancing internal septations can be seen on this image. Atelectasis can be seen in the visualized lung bases.

proliferative lesion.” Definitive diagnosis would await full excision of the lesion.

The patient underwent a lumpectomy. Full resection by lumpectomy yielded a 9-g specimen in which the mass measured $4 \times 2 \times 1.5$ cm. Microscopically, the tissue showed stromal fibrosis, papillations, micropapillary structures, and usual ductal epithelial hyperplasia without atypia (see Fig. 8). Differential diagnoses based on the histology included fibroadenoma, juvenile papillomatosis, and intraductal papilloma. The final pathology of the breast specimen was reported as a benign fibroepithelial lesion most consistent with juvenile fibroadenoma. Consultation had been performed by Dr Edi Brogi, Breast Pathologist at Memorial Sloan Kettering Cancer Center (see Acknowledgments).

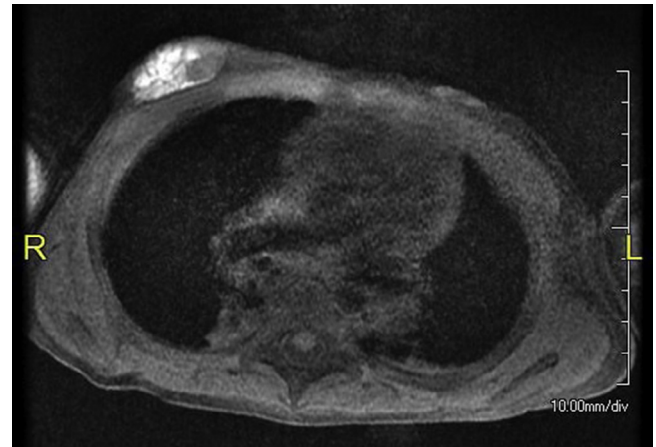
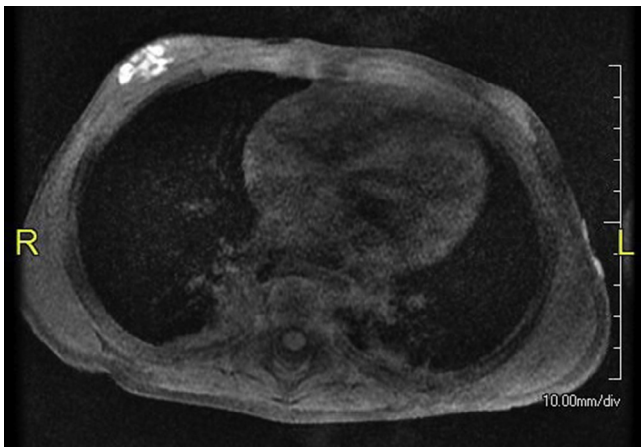


Fig. 3A and 3B – Axial precontrast T1 images with fat saturation show the inferior (left) and superior (right) aspects of the right breast mass, with each slice showing the cystic and solid aspects of the mass. High precontrast T1 signal can be seen in the areas of the mass that are thought to correlate with the ultrasound correlate cystic spaces. Precontrast T1 hyperintensity in general can be caused by blood, proteinaceous material, or melanin. In this particular case, hemorrhagic and proteinaceous debris are most likely. The solid portion of the mass demonstrates isointense T1 signal.

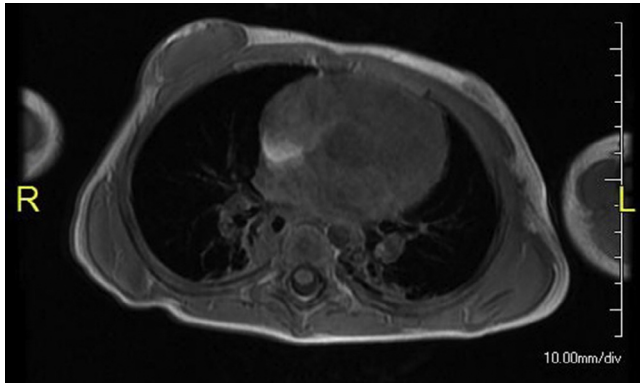


Fig. 5 – Axial precontrast T1 non-fat-suppressed sequence through the mass shows T1 signal that is isointense to muscle. Note the normal small left breast bud. The right breast mass is markedly asymmetric with the left. No normal right breast bud could be delineated from the mass.

Discussion

Fibroadenomas are one of the most common masses encountered on a daily basis in breast imaging. The majority of cases are found in young women, and it is estimated that fibroadenomas comprise approximately 68% of breast masses in adolescents [1]. Some sources describe fibroadenomas as making up 91% of solid breast masses under the age of 19 [5,6]. This case is unique in that the patient presented at 2 years of age. There are very few cases in the literature describing masses in pediatric patients, especially in patients under the age of five. While masses in such ages are categorically benign, there are isolated extremely rare case reports describing malignancy in toddlers, which is a reason to make a definitive diagnosis. One such differential consideration is juvenile secretory carcinoma, which can even coexist with papillomatosis. While rare, it is important to exclude as it requires surgical intervention and nodal evaluation [7].

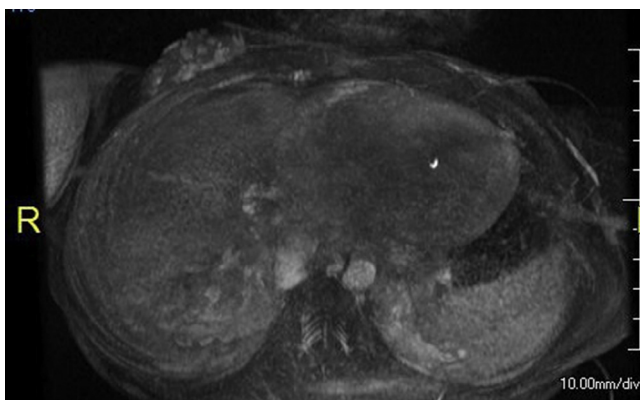


Fig. 6 – Maximum intensity projection (MIP) image constructed from the contrast-enhanced sequences demonstrates the heterogeneity of contrast enhancement throughout the mass.

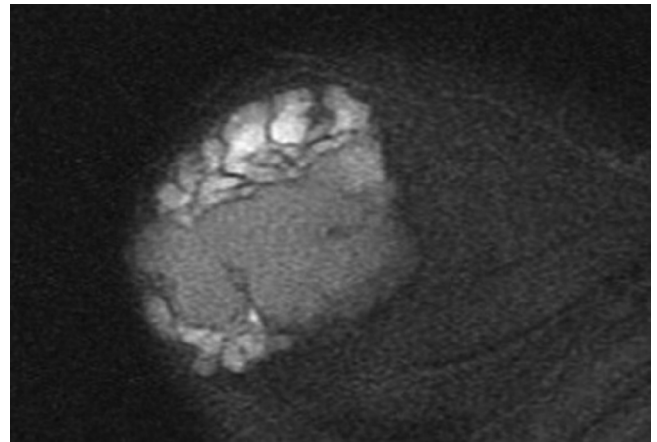


Fig. 7 – Right coronal T2 with fat saturation nicely demonstrates the thin internal septations. These are seen as nonenhancing on the postcontrast images. The margins of the mass can be well seen in this image as circumscribed. Notice the varying T2 signal intensities in the superior and inferior aspects of the mass compared to the central T2 signal. This correlates with the solid and cystic regions of the mass that were also seen on ultrasound.

Prior to imaging, the differential considerations in this case were normal variant anatomy and premature thelarche. Based on the initial clinical examination, only slightly asymmetric breast tissue was noted. After laboratory analysis was performed, no abnormality was found to suggest precocious puberty or congenital anomalies. Imaging was pursued to evaluate for a focal mass and to assess the symmetry with the contralateral breast bud. The overwhelming majority of diagnostic considerations for the mass in this patient remained benign; however, by initial histology, papilloma or juvenile papillomatosis could not be excluded.

Strictly on the basis of imaging, differential considerations included lymphangioma, juvenile papillomatosis, fibroadenoma (among other benign breast masses), or malignancy [8]. Although breast cancers account for less than 1% of breast lesions in the pediatric population, the implications of such diagnoses require thorough evaluation to exclude such lesions [8].

The imaging characteristics of this particular mass are not completely typical for a fibroadenoma. Some of the more common features of fibroadenomas seen in this case include a hypoechoic solid mass with circumscribed margins, oval morphology, and parallel orientation [9]. The MRI characteristics showed T2 signal hyperintensity with regions of enhancement and nonenhancing internal septations, which are also seen in fibroadenomas [9]. The evolution of the mass (solid to more cystic) from the patient's original ultrasound examination can be seen in myxoid fibroadenomas of the adolescent female [8]. Due to the imaging change as well as the clinical examination differences in her 1-month to 5-month follow-up visits, ultrasound-guided core biopsy was performed. The yield from core sampling was insufficient tissue for thorough pathologic analysis. Given the patient's age, size of the mass,

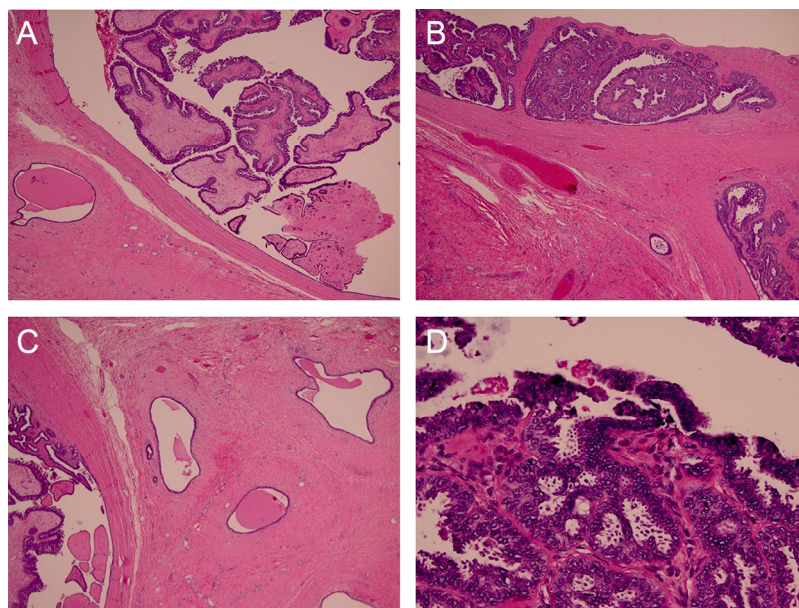


Fig. 8 – Histopathology, all with hematoxylin and eosin stain. (A) Papilloma within a duct, fronds lined by epithelium having usual type hyperplasia (40× magnification). (B) Epithelial proliferation outside of duct (40× magnification). (C) Stromal sclerosis and duct ectasia, papillary structures with sclerosis or epithelial hyperplasia (40× magnification). (D) Epithelial hyperplasia along many of the ducts and glands (400× magnification).

and clinical or imaging changes, surgical intervention was prompted despite risks associated with breast bud removal.

The importance of differentiating between a fibroadenoma and juvenile papillomatosis is significant, considering the patient's future management and her prognosis. If, in fact, the mass simply represents a fibroadenoma, there is no need for surveillance other than clinical follow-up [8]. Papillomatosis, on the other hand, portends a poorer prognosis as it is associated rarely with malignancy and atypia [8]. The imaging characteristics can be very similar because papillomatosis may appear as a cystic mass with benign enhancement kinetics [8].

Ultimately, clinical suspicion of the 2-year-old's provider and imaging characteristics of the mass prompted further evaluation and surgical consultation. Extensive discussion from surgeons, pathologists, and radiologists at different institutions was utilized to form an organized and thorough course of management for the patient and her family. Multi-institutional consensus from pathologists determined findings most representative of a juvenile fibroadenomas. Continued ultrasound follow-up has been performed with no recurrence to date.

Acknowledgment

We would like to thank Dr Edi Brogi, Breast Pathologist at Memorial Sloan Kettering Cancer Center, for her intellectual contribution to the pathologic evaluation of the mass.

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