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Analysis of surgically excised breast masses in 119 pediatric patients.

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ABSTRACT:

Introduction: Breast masses in children and adolescents are uncommon and the vast majority are benign. Despite the low risk of malignancy a thorough workup is warranted and surgical excision may be recommended. In the current literature there are limited analyses of breast masses in the pediatric population. In addition, management of breast masses in children and adolescents is highly variable. The purpose of our study is to analyze the demographic characteristics, pathology and clinical management of 119 pediatric patients with breast masses; one of the largest studies in the literature to date.

Methods: We performed a retrospective review of all patients who underwent surgical excision of a breast mass at a single tertiary care center from June 2009 to November 2013. Demographic data, imaging, pathology results and management plans were reviewed.

Results: Over the study period 135 masses were excised from 119 patients. 117 of the patients were female, the average age of patients was 15.3 years, the average mass size was 3.15 cm and 20.3% had a family history of breast cancer. 68% of patients had a pre-operative ultrasound, and 31.9% underwent a period of observation recommended by either their primary physician or by their surgeon. The most common documented indication for resection was patient anxiety. All breast masses in this population were benign, with fibroadenoma being by far the most common histopathology.

Conclusions: Breast malignancy is extremely rare in the pediatric population and recommended management in the absence of concerning clinical or radiologic findings is non-operative. However, only 31.9% of patients in our series underwent some form of observation. In addition, patient and family anxiety was documented as a reason for excision in a significant number of cases.

INTRODUCTION:

Breast masses are rare in children and adolescents, with an estimated incidence of 3.25% [1]. Malignant breast masses are even less common, with breast carcinoma representing less than 1% of all childhood cancers and less than 0.1% of all breast cancers [2,3,4]. The differential diagnosis for a pediatric breast mass is wide, however, fibroadenomas represent the most common breast pathology in adolescence, constituting 30-50% of masses in medical series and 44-94% of masses in surgical series [5,6]. Fibroadenomas tend to be slow growing and regress with age in up to 10-40% of patients [1,5,6] They are also almost always benign, with a documented malignant transformation rate of less than 0.3% [5]. Juvenille fibroadenomas are defined as rapidly growing fibroadenomas in the adolescent population. Phyllodes tumors are closely related to fibroadenomas, however, they may be locally destructive and have the potential to be malignant [5]. While there are some clinical and imaging characteristics, such as size and rapid growth, that may distinguish phyllodes tumors from fibroadenomas, definitive diagnosis can only be obtained from histology [3,4,5].

In contrast to the management of breast masses in adults, there is currently a wide variation in the treatment protocols for pediatric breast masses. Given the low rate of malignancy, guidelines for management of pediatric breast lesions typically recommend a conservative approach [1,3,5,11]. Masses without alarming clinical or radiographic characteristics can be observed for several months for spontaneous regression. In addition to concerns about malignancy excision may be warranted in cases of rapidly growing masses, as these may distort breast architecture [5].

Recommended indications for surgical excision include rapid growth, diameter greater than 5 cm, persistence without regression, systemic symptoms, personal history of malignancy or radiation and concerning features on imaging [3,5]. However, in the wake of increasing public awareness of breast cancer in adults, patients and families may experience significant anxiety, and often prefer operative management for definitive diagnosis.

METHODS:

A retrospective review of all pediatric breast masses surgically excised from June 2009 to November 2013 at a single tertiary children's hospital was performed. Data was collected from the electronic medical record in compliance with IRB approval and recorded in Microsoft Excel. Demographic data collected included patient age at surgery, gender, past medical history, body mass index, family history of breast disease, size of mass and symptoms. Data on clinical course was also collected, including imaging studies, biopsy results, clinical care plan, indication for surgery and specimen pathology.

RESULTS:

A total of 135 masses removed from 119 patients were reviewed. 117 (98.3%) of the patients were female and only 2 (1.7%) of the patients were male (Table 1A). The pathology of the breast masses in the 2 male patients demonstrated one case of galactocoele and one case of ductal ectasia. The average age was 15.3 years old with a range of 1.17 to 19 years. On average patients presented after 25.7 weeks of symptoms, however, this was highly variable (Table 1B). Mass size ranged between 0.8 and 13.2 cm with an average of 3.2 cm. 58% of patients underwent documented diagnostic ultrasound (Table 1B). The percent of patients receiving pre-operative ultrasound did not change significantly over time from 2010 to 2013 (data not

shown). We have published a detailed analysis of the ultrasound results of this population separately [8].

Overall, 48.4% of patients received some form of initial work-up by their primary physician, including ultrasound imaging and/or biopsy (Fig 1A). Only two patients had imaging other than ultrasound. One patient had a PET/CT due to a personal history of cancer and one patient had a mammogram ordered at an outside hospital. The percentage of patients undergoing an initial work up prior to referral to surgery remained relatively constant throughout the study period. Only 31.9% of patients underwent some period of observation ordered by either their primary medical doctor (PMD) or by their surgeon. This number did increase over the time period of the study with 66.7% of patients receiving some period of observation in 2013 (Fig 1B).

We also analyzed the indications for surgical excision documented for each operative encounter. Indications included abnormal imaging results, continued growth of mass, pain, size and patient anxiety. The most common indication for excision was anxiety, with 23.5% of patients and families requesting excisional biopsy. This trend was more apparent in the later years of the study (Fig 2).

We next analyzed the pathology of the surgical specimens. In our series all masses were benign. The most common pathologic diagnosis was, as expected, fibroadenoma at 75.2% of masses (Table 2). Other common diagnoses included juvenille fibroadenoma, tubular adenoma, pseudoangiomatous stromal hyperplasia (PASH), supernumary nipple, benign cyst and fibrocystic changes.

DISCUSSION:

Pediatric breast masses are very rare and the vast majority are benign. While the general recommendation is observation of non-suspicious lesions, practice habits vary widely. Here we examined 119 patients from a single tertiary center who underwent surgical excision of breast masses during a 4.5 year period. Demographic

analysis of our population revealed a similar profile to other studies [9,10], with the majority of patients being females in mid-adolescence. Multiple studies have shown that higher body mass index (BMI) in adolescence has a protective effect on both benign and malignant breast disease (7,17,18). Consistent with previous reports the patients in our series had an average BMI of 22.4, within the normal range. Ultrasound is the most common modality of evaluating breast masses in the pediatric population and 58% of our study population underwent pre-operative ultrasound.

In our series only 31.9% of patients underwent some period of observation, either recommended by their primary medical doctor (PMD) or by their surgeon. While this percentage is low, the overall rates of conservative management increased from 6.7% in 2009 to 40% in 2013. In addition, the most common documented indication for surgical excision was patient and family anxiety. The histologic analysis of surgical resection specimens demonstrated that all lesions excised in this population were benign.

Taken together this data suggests that the wide variation in clinical practice in the treatment of pediatric breast masses may be leading to unnecessary operations. A common indication for surgical excision was patient and family anxiety, which is not unexpected given the current level of awareness of adult breast cancer.

A standardized approach for management of breast masses is well established in adults. However, there is no standard protocol for evaluation or management of breast masses in children and adolescents. Ultrasound is the imaging modality of choice given dense breast tissue in pediatric patients and the desire to minimize radiation exposure. In adults, the American College of Radiology Breast Imaging Reporting and Data System (BI-RADS) classification is used to stratify risk of malignancy and guide management [16]. However, in both our series and others the BI-RADS system has not shown good concordance between imaging characteristics and mass pathology [8,10]. This indicates that a new imaging classification may be necessary in children and that observation may be the optimal management, even in

patients with BI-RADS 4 imaging findings. Cytologic examination by fine needle aspiration or core biopsy are rarely used in an effort to avoid repeated invasive procedures in children (19). Recommended observation periods of pediatric breast masses vary from one to four menstrual cycles (1,3,21,22) with no standard guideline.

While surgical excision is necessary in certain clinical scenarios, encouraging initial periods of observation may prevent unnecessary surgeries. This can be approached by both the PMD and by the surgeon. Focusing on allaying patient and family concerns about malignancy may also decrease the number of patients requesting excisional biopsy.

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FIGURE LEGENDS

Figure 1: Evaluation and Management of Breast Lesions

(A) Percentage of patients who underwent work-up by their primary medical doctor (PMD) prior to surgical evaluation. Work-up includes any imaging (ultrasound, mammogram, PET/CT) and any biopsy. (B) Percentage of patients who underwent a period of observation prior to surgery. Observation was ordered by PMD (white), or by surgeon (black).

Figure 2: Indications for Surgical Excision

Percentage of patients for which each complaint was documented as the indication for surgical excision for each year and for all patients combined. Multiple indications for each patient were included if they were documented in the electronic medical record.

Table 1: Study Population Characteristics

A

	% of total	n
Gender		
Female	98.3	117
Male	1.7	2
Family history of breast disease	17.6	21
Pain	18.4	22
Ultrasound	58.0	69

B

	% of total	range
Age (years)	15.3 ± 2.9	1.17 - 19
Size (cm)	3.2 ± 1.9	0.8 - 13.2
Length of symptoms (weeks)	25.7 ± 41.5	1 - 312
BMI	22.4 ± 4.5	15.1 - 41.1

Table 2: Pathology of Surgical Specimens

	% of total	n
Fibroadenoma	75.2	88
Juvenille Fibroadenoma	5.9	7
Tubular adenoma	4.2	5
Fibroadenoma with PASH	2.5	3
Supernumary nipple	2.5	3
Benign cyst	1.71	2
Fibrocystic changes	1.71	2
Other	6.7	8

Fig 1: Evaluation and Management of Breast Lesions

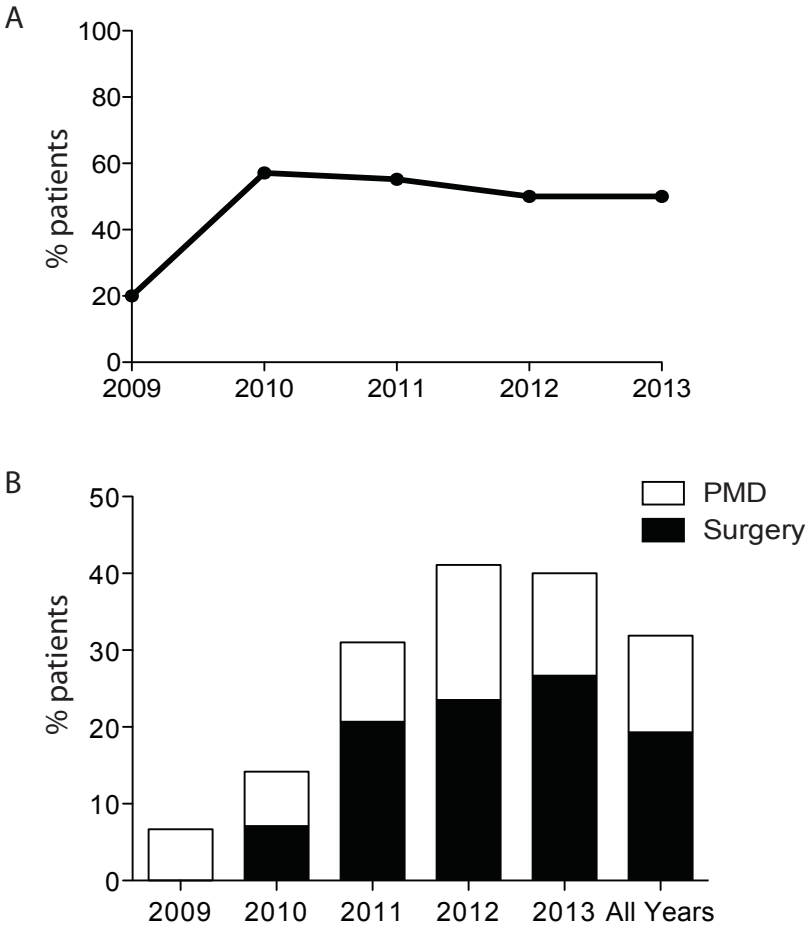

Fig 2: Indications for Surgical Excision