Management of Pediatric and Adolescent Breast Masses

Raelene D. Kennedy, MD¹ Judy C. Boughey, MD¹

¹ Department of Surgery, Mayo Clinic, Rochester, Minnesota

Semin Plast Surg 2013;27:19–22.

Address for correspondence Dr. Judy C. Boughey, MD, Mayo Clinic, Department of Surgery, 200 First Street SW, Rochester, MN 55905 (e-mail: Boughey.judy@mayo.edu).

Abstract

Breast masses in children and adolescents are uncommon and most often benign. Occasionally, however, they require surgical intervention for lifestyle limiting symptoms or malignant potential. These masses are best evaluated with physical exam and ultrasound. Breast masses likely to be encountered by the surgeon in the pediatric and adolescent population include intraductal papillomas, phyllodes tumors, primary breast cancer, and metastatic lesions. Unlike adults, pediatric and adolescent breast cancer tends to be of the secretory variety and typically have less metastatic potential. However, cases of inflammatory and medullary breast cancers have also been reported in girls and appear more aggressive. Radiation exposure during breast development is a risk factor to subsequent development of breast cancer. Surgical objective for a concerning pediatric and adolescent breast mass is complete resection while preserving normal breast development, when appropriate. The need for routine axillary dissection for malignant cases in children appears unnecessary from the limited data available, and the authors favor sentinel lymph node sampling and reserve axillary dissection for positive lymph nodes.

Keywords

- pediatric
- breast cancer
- phyllodes
- intraductal papilloma
- surgery

Breast masses are uncommon in children and adolescents, but are associated with significant patient and family distress when they occur. The prevalence of breast masses in teenage girls is 3.2%.¹ Pediatric breast masses are typically benign, although breast malignancies have been reported in children. Ninety-five percent of surgically removed pediatric breast masses are benign fibroadenomas and only 0.02% are malignancies.^{2–4}

The differential diagnosis for pediatric breast masses is similar to those in adults, and includes phyllodes tumors, primary breast cancer, sarcoma, lymphangioma or hemangioma, metastatic cancer, intraductal papilloma, fibroadenoma (and giant fibroadenoma), abscesses, and benign cysts. In this article, we will review the most common masses requiring surgery, including breast malignancies, phyllodes tumors, and intraductal papillomas.

Diagnosis

A thorough patient history and physical exam are essential for evaluation of any breast mass. Careful detail pertaining to the

breast mass, including pain, nipple discharge, precipitating factors, duration and progression, is essential to guiding diagnosis.⁵ Ultrasound provides the best imaging in the pediatric age group and is an essential diagnostic tool.⁶ Fine needle aspiration (FNA) biopsy or core needle biopsy can often provide pathological diagnosis; however, one may choose to proceed directly to excisional biopsy if clinical suspicion warrants to avoid repeated traumatic procedures in pediatric patients. Magnetic resonance imaging (MRI) provides an imaging modality without radiation exposure to children, but efficacy and accuracy of MRI breast evaluation in children has not yet been validated.

Intraductal Papilloma

Intraductal papillomas are usually subareolar lesions that are often difficult to palpate.^{7,8} They are benign lesions caused by proliferation of ductal cells.⁹ Intraductal papillomas characteristically present with nipple discharge that may be sanguineous or serosanguineous.⁹ Physical exam with palpation

Issue Theme The Adolescent Breast;
Guest Editors, Valerie Lemaire, MD, MPH,
FRCS and Patricia S. Simmons, MD

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Publishers, Inc., 333 Seventh Avenue,
New York, NY 10001, USA.
Tel: +1(212) 584-4662.

DOI <http://dx.doi.org/10.1055/s-0033-1343991>.
ISSN 1535-2188.

of the lesion may reproduce nipple discharge. Cytology will show ductal cells in the nipple discharge.⁸ Gold standard diagnosis is a ductogram; however, ultrasound may be a more feasible first-line study in children.

Adult studies show an increased risk of breast cancer in papillomas; however, papillomas in the pediatric population have proven benign in all cases.^{9–11} Treatment of intraductal papillomas in all ages is by local surgical excision.

Phyllodes Tumors

Phyllodes tumors, also known as cystosarcoma phyllodes, are stromal tumors of the breast. They are most common in middle-aged women, but have been reported in children as young as 10 years old.^{7,12,13} These can be large, painless, rapidly growing tumors that are difficult to distinguish clinically from giant fibroadenomas.^{7,14} Ultrasound findings are not typically diagnostic, but features seen include lobulations and a heterogeneous sonographic pattern, and usually lack microcalcifications.¹⁴ Core needle biopsy for diagnosis can help guide surgical planning. In large tumors, heterogeneity in cellularity across the spectrum of fibroadenoma and phyllodes tumor can be seen and therefore excision is indicated.

Histologically, phyllodes tumors are similar to fibroadenomas but show more stromal proliferation.¹⁵ Phyllodes tumors are classed based on histology and may be benign, intermediate, or malignant.¹⁶ The higher grade tumors have increased mitotic rate and show similarity to sarcomas. Despite histologic classification, all phyllodes tumors (benign, intermediate, and malignant) have potential to metastasize and recur locally.⁷ Adult 5-year survival rates for benign, intermediate, and malignant phyllodes tumors are 96%, 74%, and 66%, respectively.

Phyllodes tumors should be treated with complete surgical resection. In adults, a 1-cm surgical margin is recommended.¹⁷ However, there is some thought that adolescent phyllodes tumors are less aggressive and a smaller surgical margin may be acceptable.^{12,18}

Primary Breast Cancer

Primary breast cancer is rare in children and adolescents. Less than 1% of breast cancer patients are younger than 30 years and the incidence of breast cancer in women younger than 20 years is 1 in 1,000,000.^{2,19,20} Thirty-nine cases of primary breast cancer in pediatric patients have been published to date.^{20–45}

Younger patients are more likely than older adults to present with a large mass at the time of breast cancer diagnosis.⁴⁶ Physical exam demonstrates a firm, nonmobile, poorly circumscribed mass, similar to adult women with breast cancer. However, nipple retraction and discharge appear less common in children.²⁰

Secretory adenocarcinoma (formerly known as juvenile carcinoma) is the most common primary breast cancer in the pediatric population and accounts for 31 of the 39 reported cases (84%).²¹ Secretory adenocarcinoma has a

unique capsule that is thick walled and may cause the mass to appear cystic on ultrasound. Most reports of pediatric secretory adenocarcinoma describe a slow-growing and benign clinical picture. However, 3 of 31 reported cases (9.7%) identified nodal metastases at the time of surgical excision, while most of the other cases never underwent nodal staging.^{20–45} No mortalities have been published from pediatric secretory adenocarcinoma; however, long-term follow-up data are lacking.

Cases of medullary and inflammatory cancer have also been described in pediatric patients. These cancers are far less common than secretory carcinoma but are associated with more aggressive disease pathology. Medullary carcinoma has been reported in six patients under the age of 18 years (11%), four of whom expired from associated metastatic disease.²⁰ Two cases of inflammatory cancer, both 12-year-old girls, have been published, with one death and no follow-up reported on the other patient.^{25,40}

Due to lack of data, surgical management of primary breast cancer in the pediatric patient remains controversial. Complete surgical resection is the goal in all cases, however, maintaining normal breast development should also be considered whenever possible. The need for axillary lymph node staging or axillary dissection remains unclear. With at least 9.7% nodal metastases observed in secretory carcinoma and the aggressive nature of medullary and inflammatory cancers, we recommend lymph node staging in all patients. Axillary ultrasound for clinical preoperative workup, as in adults, is recommended. Extrapolating from management of breast cancers in adults, sentinel lymph node surgery for nodal staging is recommended for clinically node-negative cases and axillary dissection for node positive cases. Furthermore, radiation and chemotherapy can be associated with increased risk of subsequent cancers in young patients; therefore, risk and benefit should be carefully considered based on tumor type and stage of disease.

Breast Masses from Metastatic Disease

Breast masses caused by metastatic disease have also been described in pediatric patients and are more common than primary breast cancer.^{2,47} Primary malignancies have included hepatocarcinoma, non-Hodgkin lymphoma, leukemia, and rhabdomyosarcoma.^{2,17,48,49} These cases are typically diagnosed based on oncologic history and confirmed by ultrasound, with or without FNA. Ultrasound features of these masses are variable, but easily identified as different from more typical adolescent masses such as fibroadenomas or cysts.⁴⁹ These masses need to be managed in the context of the patient's primary tumor and metastatic stage.

Childhood Radiation Exposure and Breast Cancer Risk

Children treated with chest radiation for other pediatric malignancies are known to be at increased risk of developing breast cancer later in life. Radiation exposure for girls during peak breast development, typically 10 to 16 years of

age, is most harmful.⁵⁰ Approximately 40% of girls treated with radiation for Hodgkin lymphoma will develop breast cancer; it takes an average of 20 years to develop.⁵⁰ For these women, annual clinical breast examination and annual MRI for screening of breast cancer development is recommended⁵¹ and bilateral prophylactic mastectomies to decrease risk of breast cancer development can be considered.

Conclusion

Pediatric and adolescent breast masses are fortunately uncommon and unlikely to require surgical intervention, thus limited data are available pertaining to their management. However, cases of malignancy, including phyllodes tumors, ductal adenocarcinomas, and metastatic lesions, have been documented in children and adolescents. Therefore, malignancy should be considered in the diagnosis of a pediatric and adolescent breast mass until formally ruled out. Surgical principles gained from the adult population (complete excision with or without lymph node sampling) have been extrapolated for use in children, although these methods have not been validated in the pediatric population. Further research is required to clarify best management, although with limited incidence of cases, large-scale trials are likely not feasible.

References

- Neinstein LS, Atkinson J, Diamant M. Prevalence and longitudinal study of breast masses in adolescents. *J Adolesc Health* 1993;14(4):277–281
- Simmons PS, Jayasinghe YL, Wold LE, Melton LJ III. Breast carcinoma in young women. *Obstet Gynecol* 2011;118(3):529–536
- Jayasinghe Y, Simmons PS. Breast disorders in the female. In: Fisher MM, Alderman EM, Kreipe RE, Rosenfeld WD, eds. *Textbook of Adolescent Health Care*. Elk Grove Village, IL: American Academy of Pediatrics; 2011:621–634
- Bobo JK, Lee NC, Thames SF. Findings from 752,081 clinical breast examinations reported to a national screening program from 1995 through 1998. *J Natl Cancer Inst* 2000;92(12):971–976
- Pruthi S, Jones KN, Boughey JC, Simmons PS. Breast masses in adolescents: clinical pearls in the diagnostic evaluation. *Am Fam Physician* 2012;86(4):325–326
- Weinstein SP, Conant EF, Orel SG, Zuckerman JA, Bellah R. Spectrum of US findings in pediatric and adolescent patients with palpable breast masses. *Radiographics* 2000;20(6):1613–1621
- De Silva NK, Brandt ML. Disorders of the breast in children and adolescents, Part 2: breast masses. *J Pediatr Adolesc Gynecol* 2006;19(6):415–418
- Greydanus DE, Parks DS, Farrell EG. Breast disorders in children and adolescents. *Pediatr Clin North Am* 1989;36(3):601–638
- Fallat ME, Ignacio RC Jr. Breast disorders in children and adolescents. *J Pediatr Adolesc Gynecol* 2008;21(6):311–316
- Rosen PP. Papillary duct hyperplasia of the breast in children and young adults. *Cancer* 1985;56(7):1611–1617
- Wilson M, Cranor ML, Rosen PP. Papillary duct hyperplasia of the breast in children and young women. *Mod Pathol* 1993;6(5):570–574
- Parker SJ, Harries SA. Phyllodes tumours. *Postgrad Med J* 2001;77(909):428–435
- Alabassi A, Fentiman IS. Sarcomas of the breast. *Int J Clin Pract* 2003;57(10):886–889
- Chao TC, Lo YF, Chen SC, Chen MF. Sonographic features of phyllodes tumors of the breast. *Ultrasound Obstet Gynecol* 2002;20(1):64–71
- Chang DS, McGrath MH. Management of benign tumors of the adolescent breast. *Plast Reconstr Surg* 2007;120(1):13e–19e
- West KW, Rescorla FJ, Scherer LR III, Grosfeld JL. Diagnosis and treatment of symptomatic breast masses in the pediatric population. *J Pediatr Surg* 1995;30(2):182–186, discussion 186–187
- Mangi AA, Smith BL, Gadd MA, Tanabe KK, Ott MJ, Souba WW. Surgical management of phyllodes tumors. *Arch Surg* 1999;134(5):487–492, discussion 492–493
- Neinstein LS. Breast disease in adolescents and young women. *Pediatr Clin North Am* 1999;46(3):607–629
- Shannon C, Smith IE. Breast cancer in adolescents and young women. *Eur J Cancer* 2003;39(18):2632–2642
- Murphy JJ, Morzaria S, Gow KW, Magee JF. Breast cancer in a 6-year-old child. *J Pediatr Surg* 2000;35(5):765–767
- Ramirez G, Ansfield FJ. Carcinoma of the breast in children. *Arch Surg* 1968;96(2):222–225
- Nonomura A, Kimura A, Mizukami Y, et al. Secretory carcinoma of the breast associated with juvenile papillomatosis in a 12-year-old girl. A case report. *Acta Cytol* 1995;39(3):569–576
- Serour F, Gilad A, Kopolovic J, Krispin M. Secretory breast cancer in childhood and adolescence: report of a case and review of the literature. *Med Pediatr Oncol* 1992;20(4):341–344
- Eskelinen M, Vainio J, Tuominen L, Vihko R, Klemi P, Collan Y. Carcinoma of the breast in children. *Z Kinderchir* 1990;45(1):52–55
- Chamadol W, Pesie M, Puapairoj A. Inflammatory carcinoma of the breast in a 12-year-old Thai girl. *J Med Assoc Thai* 1987;70(9):543–548
- Ferguson TB Jr, McCarty KS Jr, Filston HC. Juvenile secretory carcinoma and juvenile papillomatosis: diagnosis and treatment. *J Pediatr Surg* 1987;22(7):637–639
- Karl SR, Ballantine TV, Zaino R. Juvenile secretory carcinoma of the breast. *J Pediatr Surg* 1985;20(4):368–371
- Rosen PP, Lyngholm B, Kinne DW, Beattie EJ Jr. Juvenile papillomatosis of the breast and family history of breast carcinoma. *Cancer* 1982;49(12):2591–2595
- Massé SR, Rioux A, Beauchesne C. Juvenile carcinoma of the breast. *Hum Pathol* 1981;12(11):1044–1046
- Rosen PP, Cantrell B, Mullen DL, DePalo A. Juvenile papillomatosis (Swiss cheese disease) of the breast. *Am J Surg Pathol* 1980;4(1):3–12
- Tavassoli FA, Norris HJ. Secretory carcinoma of the breast. *Cancer* 1980;45(9):2404–2413
- Heydenrych JJ, Villet WT, von der Heyden U. Carcinoma of the breast in children: a case report and review of the literature. *S Afr Med J* 1980;57(24):1005–1008
- Byrne MP, Fahey MM, Gooselaw JG. Breast cancer with axillary metastasis in an eight and one-half-year-old girl. *Cancer* 1973;31(3):726–728
- Oberman HA, Stephens PJ. Carcinoma of the breast in childhood. *Cancer* 1972;30(2):470–474
- Simpson JS, Barson AJ. Breast tumours in infants and children: a 40-year review of cases at a children's hospital. *Can Med Assoc J* 1969;101(2):100–102
- McDivitt RW, Stewart FW. Breast carcinoma in children. *JAMA* 1966;195(5):388–390
- Feig SA. Radiation risk from mammography: is it clinically significant? *AJR Am J Roentgenol* 1984;143(3):469–475
- Guyer PB, Dewbury KC. Sonomammography in benign breast disease. *Br J Radiol* 1988;61(725):374–378
- Tanimura A, Konaka K. Carcinoma of the breast in a 5 years old girl. *Acta Pathol Jpn* 1980;30(1):157–160

- 40 Nichini FM, Goldman L, Lapayowker MS, Levy WM, Maier W, Rosemond GP. Inflammatory carcinoma of the breast in a 12-year-old girl. *Arch Surg* 1972;105(3):505–508
- 41 Lipitt WH, Medart WS Jr, Ramsey SN. Breast cancer in a 10-year-old girl. *Surgery* 1970;68(2):395–396
- 42 Farrow JH, Ashikari H. Breast lesions in young girls. *Surg Clin North Am* 1969;49(2):261–269
- 43 Close MB, Maximov NG. Carcinoma of the breast in young girls. *Arch Surg* 1965;91:386–389
- 44 Hammar B. Childhood breast carcinoma: report of a case. *J Pediatr Surg* 1981;16(1):77–78
- 45 Teasdale C, Baum M. Breast cancer in a schoolgirl. *Lancet* 1976;2(7986):627
- 46 Ashley S, Royle GT, Corder A, et al. Clinical, radiological and cytological diagnosis of breast cancer in young women. *Br J Surg* 1989;76(8):835–837
- 47 Dehner LP, Hill DA, Deschryver K. Pathology of the breast in children, adolescents, and young adults. *Semin Diagn Pathol* 1999;16(3):235–247
- 48 Rogers DA, Lobe TE, Rao BN, et al. Breast malignancy in children. *J Pediatr Surg* 1994;29(1):48–51
- 49 Chateil JF, Arboucalot F, Pérel Y, Brun M, Boisserie-Lacroix M, Diard F. Breast metastases in adolescent girls: US findings. *Pediatr Radiol* 1998;28(11):832–835
- 50 Gold DG, Neglia JP, Dusenbery KE. Second neoplasms after megavoltage radiation for pediatric tumors. *Cancer* 2003;97(10):2588–2596
- 51 Saslow D, Boetes C, Burke W, et al; American Cancer Society Breast Cancer Advisory Group. American Cancer Society guidelines for breast screening with MRI as an adjunct to mammography. *CA Cancer J Clin* 2007;57(2):75–89