Case Report

Metastatic rhabdomyosarcoma of breast: A rare presentation

Gaurav P S Gahlot[1], Tathagata Chatterjee[2], Debashish Mukherjee[3], Vijender Singh[4]

From [1]Associate Professor, [2]Head, Department of Lab Sciences and Molecular Medicine, [3]Professor, Department of Oncosurgery, [4]Junior Resident, Department of Radiation Oncology, Army Hospital (Referral and Research), New Delhi, India

ABSTRACT

Rhabdomyosarcoma (RMS) is the most common pediatric soft-tissue sarcoma with head and neck as the preferred site followed by the genitourinary system in 13–17 years. It can involve the breast as either primary or secondary. A multidisciplinary treatment approach of chemotherapy or radiotherapy or mastectomy depends on the clinical profile of the patient. Embryonal RMS has a better prognosis than alveolar and pleomorphic subtypes. Here, we report the case of a 17-year-old girl who is a known case of primary embryonal RMS of the right maxillary antrum diagnosed 2 years back and administered neoadjuvant chemotherapy followed by radiotherapy-concurrent chemoradiotherapy. Later, she developed right breast lump, which on fine-needle aspiration cytology (FNAC) of the lump showed characteristic features of metastatic RMS, thus avoided surgical intervention of lumpectomy or mastectomy. The patient received adjuvant chemotherapy followed by radiotherapy and is doing well. The aim of the present case is to assess the safer, faster role of FNAC in the diagnosis of breast RMS. It is also recommended to include ultrasound/mammography of the breast as a protocol in the metastatic workup of RMS for adolescent females.

Key words: Breast, Fine-needle aspiration cytology, Metastasis, Rhabdomyosarcoma

Rhabdomyosarcoma (RMS) is the most common soft-tissue sarcoma in children constituting 3.5% of all cancers in them with the head and neck as the predominant site. RMS has a propensity to metastasize to the bone, bone marrow, lung, liver, brain, and lymph nodes in 14–28%, whereas, to the breast in 3.7–6.7% of cases [1,2]. Hays *et al*. (92%), Howarth *et al*. (86%), and D'Angelo *et al*. (100%) have observed alveolar RMS as the predominant histological subtype metastasizing to the breast [2]. Fine-needle aspiration cytology (FNAC) being a quick, safe, and economical technique, thus acquires an important role in providing morphological diagnosis for timely management [3]. FNAC smears show increased cellularity of discohesive, homogenous small round tumor cells with mild-to-moderate cytological atypia, fine granular chromatin, and conspicuous nucleoli in a tigroid background [4].

Histomorphology of trucut biopsy from the lesion shows primitive round to spindle cells having scant cytoplasm, hyperchromatic nuclei with admixed scattered rhabdomyoblasts exhibiting brightly eosinophilic abundant cytoplasm, and eccentric hyperchromatic nuclei. These tumor cells are immunopositive for desmin, muscle-specific antigen (MSA), myogenin, and negative for pan-cytokeratin, CD45, CD99, and synaptophysin, therefore, a definitive diagnosis of metastatic RMS of the breast was offered. The treatment of metastatic RMS of the breast comprises chemotherapy, radiotherapy, or surgery depending on the clinical profile. Embryonal RMS has a more favorable prognosis than alveolar or pleomorphic subtypes [5].

CASE REPORT

A 16-year-old girl presented 2 years back with complaints of swelling over the right cheek and associated intermittent, scanty bleeding from the nose for 2 months duration. Contrast-enhanced computed tomography (CECT) of the nose and paranasal sinus revealed a large, heterogeneously enhancing soft-tissue mass in the right maxillary antrum associated with thinning/erosion of its wall thus suggestive of neoplastic etiology. Positron emission tomography-CT scan revealed FDG avid, heterogeneously enhancing soft-tissue mass in the right maxillary sinus measuring 5.1×4.3×5.4 cm with extension to the right ethmoidal, sphenoidal sinuses and reported as mitotic pathology.

Biopsy from the right maxillary mass was reviewed at our hospital and diagnosed as embryonal RMS. The right subtotal maxillectomy was performed, which was reported as residual RMS. Intergroup RMS Study Group protocol (VAC: vincristine, actinomycin-D, and cyclophosphamide) was started

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Correspondence to: Tathagata Chatterjee, Department of Lab Sciences and Molecular Medicine, Army Hospital (Referral and Research), New Delhi - 110 010, India. E-mail: ctathagat@hotmail.com

as neoadjuvant chemotherapy-concurrent chemoradiotherapy regime. She responded well and remained disease free for 2 years.

Then, she presented with a lump over the right breast, ultrasonography of which revealed an ill-defined, lobulated, poorly marginated mass with heterogeneous echotexture measuring 5.4×2.3×2.9 cm at superomedial quadrant (BIRADS IV) (Fig. 1). FNAC of the breast lump showed increased cellularity of round to polygonal tumor cells having high N:C ratio, coarse chromatin, and inconspicuous nucleoli; dispersed predominantly singly and small clusters in a tigroid background. Few tumor cells with rhabdomyoblastic morphology in the form of abundant cytoplasm and eccentric nuclei noted (Fig. 2a-c). The opinion of metastatic RMS was offered.

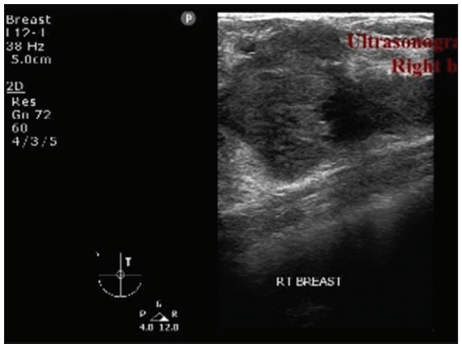

Figure 1: Ultrasonography of the right breast shows an ill-defined, lobulated, poorly marginated mass with heterogeneous echotexture at superomedial quadrant

Trucut biopsy revealed small round cells arranged in small sheets and slightly scattered pattern admixed with some rhabdomyoblasts infiltrating the underlying breast parenchyma. The individual tumor cells have a high N:C ratio, mild nuclear pleomorphism, and hyperchromatic nucleus (Fig. 3a-d). These tumor cells were immunopositive for vimentin, desmin, MSA, and myoD1 while immunonegative for pan-cytokeratin (Fig. 3e-h).

A definitive opinion of metastatic deposits of RMS to the breast was made. She received adjuvant chemotherapy in the form of gemcitabine and docetaxel under supervision followed by radiotherapy. She did not have any axillary lymphadenopathy and was followed for 14 months. She had a good response to therapy.

DISCUSSION

Soft-tissue sarcoma constitutes 6% of all pediatric neoplasm. RMS comprises 3.5% and 2% of cases among all cancer types in children <14 years and 15–19 years age, respectively. It arises in the head and neck (47%) as a predominant site followed by the genitourinary system (28%) and others (extremities, trunk, and retroperitoneum). Favorable primary sites of RMS are the orbit, head and neck (excluding cranial parameningeal sites), biliary tract, genitourinary system (excluding bladder and prostate),

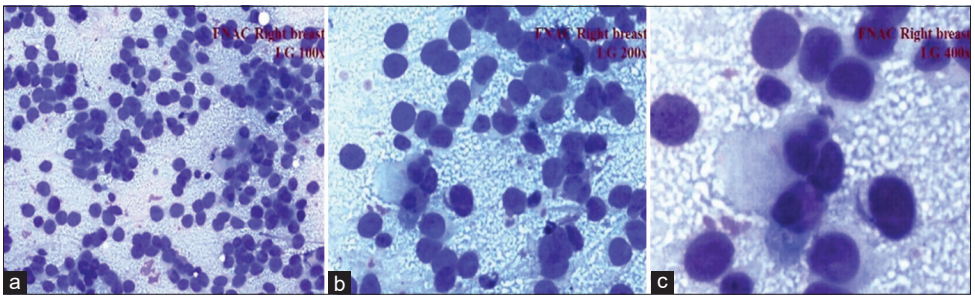

Figure 2: (a-c) FNAC smears show increased cellularity of round to polygonal tumor cells having high N:C ratio and coarse chromatin in a tigroid background

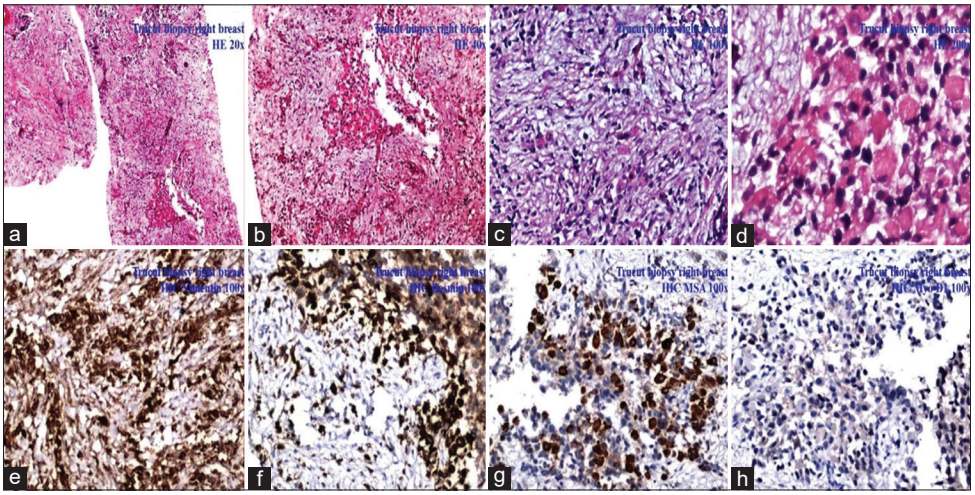

Figure 3: H&E section of trucut biopsy shows small round cells with rhabdomyoblastic morphology arranged in small sheets (a; ×40, b; ×100, c; ×200, d; ×400). Immunohistochemical profile shows tumor cells positive for vimentin (e; ×100), desmin (f; ×100), MSA (g; ×100), and Myo-D1 (h; ×100)

Table 1: Differential diagnosis of rhabdomyosarcoma

Features	RMS	Ewing's sarcoma/ PNET	Neuroblastoma	Precursor B/T-cell lymphoma/leukemia
Site	Head and neck, genitourinary, extremity, retroperitoneum	Extremities, retroperitoneum, mediastinum, pelvis	Adrenal, sympathetic nerve trunks	Lymph nodes, bone marrow
Background	Tigroid or myxoid	Cytoplasmic	Fibrillary neuropil	Lymphoglandular bodies
Arrangement	Dissociated single cells	Mixture of dissociated cells and clusters	Rosettes ++, Indian file, molded clusters	Discohesive cells
Cytological features	Marked anisocytosis, round, fusiform, myoblast (tadpole/ spider-like cells)	Double cell population: Large light cells and small dark cells	Small cell pattern and few ganglion cells	Round small- to medium-sized monomorphic cells
Cytoplasm	Gray-blue (MGG) cytoplasm Cytoplasmic vacuoles ++	Abundant to scant cytoplasm with cytoplasmic vacuoles ++	Long thin cytoplasmic processes	Sparse gray-blue
Nuclear morphology	Marked anisokaryosis, eccentric nuclei in myoblast-like cells	Uniform bland nuclei, inconspicuous nucleoli	Dark rounded to irregular nuclei, indistinct nucleoli	
Immunohistochemistry	Desmin Muscle-specific antigen, Myogenin MyoD-1	CD99 Bcl-2 FLI-1	Chromogranin, synaptophysin, neurofilament	LCA, Tdt, MPO, CD34, CD117 in precursor B/T lymphoblastic cells

and unfavorable are bladder, prostate, extremities, cranial parameningeal, trunk, and retroperitoneum [2].

In adults, malignant melanoma, bronchogenic carcinoma, ovarian, gastrointestinal tract, whereas, in children, lymphoma, leukemia, soft-tissue sarcoma (RMS) are common metastatic tumors to the breast [6]. The breast has increased propensity for metastasis in pubertal age due to high vascularity, whereas, becomes a less preferred site in adults due to increased fibrous tissue and decreased blood supply under hormonal influences. In addition, the presence of insulin-like growth factor I and II in the breast epithelium and stroma creates a suitable environment for metastatic RMS cell growth in the growing adolescent breast [7].

Breast RMS shows variable, non-specific imaging characteristics on mammography (oval or nodular mass) and ultrasonography (oval, hypoechoic, and inhomogenous mass) [8]. Cytologic subtyping of pediatric sarcomas by FNAC seems highly accurate technique and fulfills the needs as a quick, minimally invasive, safe, and accurate diagnostic procedure required to initiate pre-operative chemotherapy protocols [3]. The accuracy rate of FNAC in distinguishing benign versus malignant lesions is 92–97%, however, lower as of 76–81% for specific diagnosis in childhood tumors.

Differential diagnosis of RMS in children, includes primitive lymphoma/leukemia, primitive neuroectodermal tumor, neuroblastoma, and Ewing sarcoma, has been compared (Table 1) [9]. Other differentials as malignant melanoma (HMB45, melan A positive), small cell carcinoma (CD56, synaptophysin positive), desmoplastic small round cell tumor (pan-cytokeratin, neuron-specific enolase, and desmin positive), Merkel cell carcinoma (CK20, neurofilament positive), and mesenchymal chondrosarcoma (CD99, SOX9, and S100 positive) should preferably be considered in adults.

FNAC smears show small, round primitive tumor cells admixed with large cells having abundant eosinophilic cytoplasm rich, eccentric round hyperchromatic nuclei resembling tadpole or ribbon in a characteristic tigroid background, that is, stripped nuclei in a blue-gray background of smeared cytoplasm. The presence of binucleate cells favors alveolar RMS [9]. FNAC material may be used for immunocytochemistry (cell block), cytogenetic analysis, flow cytometry, and image analysis. Desmin is a more sensitive marker in the diagnosis of RMS, whereas myoglobin is most specific for well-differentiated rhabdomyoblasts [4,5,10]. RMS comprises primitive mesenchymal cells at various stages of myogenesis, from stellate cells (lightly amphophilic cytoplasm and central, oval nuclei) to tadpole or strap or spider cells (more cytoplasmic eosinophilia with elongate shapes) to terminally mature cells (bright eosinophilia, cytoplasmic cross striations, and multinucleation). Post-chemotherapy differentiation tends to be more evident as differentiated elements become the predominant cell population separated by therapy-induced necrosis and fibrosis.

CONCLUSION

We have described a rare case of metastatic RMS (primary in maxillary antrum) to breast, diagnosed on FNAC, and therefore avoided unnecessary lumpectomy or mastectomy in such a clinically advanced stage. FNAC is a safe, fast pre-treatment method of establishing the diagnosis of RMS so often can replace histology in reliable clinical setup. Metastatic alveolar/pleomorphic RMS has a poor prognosis. Multidisciplinary approaches of chemotherapy or radiotherapy or mastectomy depend on a patient basis. Breast examination should be included in the follow-up/ metastatic protocol diagnostic workup of RMS in adolescent girls.

REFERENCES

1. Kim JR, Yoon HM, Koh KN, Jung AY, Cho YA, Lee JS. Rhabdomyosarcoma in children and adolescents: Patterns and risk factors of distant metastasis. AJR Am J Roentgenol 2017;209:409-16.

2. D'Angelo P, Carli M, Ferrari M, AIEOP Soft Tissue Sarcoma Committee. Breast metastases in children and adolescents with Rhabdomyosarcoma: Experience of the Italian soft tissue sarcoma committee. Pediatr Blood Cancer 2010;55:1306-9.
3. Razack R, Michelow P, Leiman G, Harnekar A, Poole J, Wessels G, *et al*. An interinstitutional review of the value of FNAB in pediatric oncology in resource-limited countries. Diagn Cytopathol 2012;40:770-6.
4. Bhosale SJ, Kshirsagar AY, Sulhyan SR. Rhabdomyosarcoma of the breast-a rare malignancy. Am J Case Rep 2013;14:250-2.
5. Omranipour R, Hadi MR. Breast metastasis from multiple primary Rhabdomyosarcoma in upper extremity. Clin Pract 2012;2:e25.
6. Gurubasavanagoud Y, Champaka G, Appaji L. Breast metastases from Rhabdomyosarcoma: Case report. Int J Health Sci Res 2013;3:100-3.
7. Perks CM, Holly JM. The insulin-like growth factor (IGF) family and breast cancer. Breast Dis 2003;18:45-60.
8. Bayramoglu Z, Kebudi R, Yilmaz R, Bay SB, Kebudi A, Karanlik H, *et al*. Primary Rhabdomyosarcoma of the breast: Imaging findings and literature review. Breast Care (Basel) 2018;13:293-7.
9. Trihia HJ, Novkovic N, Provatas I, Mavrogiorgis A, Lianos E. Primary alveolar Rhabdomyosarcoma of the breast in an adult: An extremely rare case. Case Rep Pathol 2019;2019:6098747.
10. Kebudi R, Koc BS, Gorgun O, Celik A, Kebudi A, Darendeliler E. Breast metastases in children and adolescents with Rhabdomyosarcoma: A large single-institution experience and literature review. J Pediatr Hematol Oncol 2017;39:67-71.

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