

FNA Cytological Diagnosis of Breast Metastasis From a Plantar Melanoma: Case Report

Yan Yang

Capital Medical University Affiliated Beijing Friendship Hospital

Xiaomeng Yu

Capital Medical University Affiliated Beijing Friendship Hospital

Miao Wang (✉ mwang78@ccmu.edu.cn)

Capital Medical University Affiliated Beijing Friendship Hospital <https://orcid.org/0000-0002-8283-8848>

Case report

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Abstract

Background

Benign and primary malignant breast tumors are quite common, but metastatic malignancies are rare and the diagnosis is challenging due to its low incidence.

Case presentation

Here, we report a case of metastatic melanoma which was initially diagnosed in breast by fine needle aspiration(FNA). Although the suggestive diagnosis is based on the strong pigmentation of tumor cells in FNA smears, cell block and immunohistochemical melanocyte markers (HMB45 and MART-1) help to confirm the diagnosis. Later, FNAs from lower limb mass and inguinal mass also revealed the same tumor. In addition, a pigmented nevus with the appearance of malignant melanoma was found on the sole of the patient's right foot.

Conclusion

Our report illustrates the morphological evaluation on cytology ancillary testing on cell block and meticulous clinical examination play a pivotal role in establishing the correct diagnosis.

Background

The fine needle aspiration(FNA) smear is a robust tool for detection of breast epithelial lesions and primary breast carcinomas. The National Health Service Breast Cancer Screening Programme (NHSBSP) diagnostic categories are universally applied[1, 2]. The combination of clinical impression by physical examination, mammography, and FNA cytology can maximize the diagnostic accuracy for breast disease[3]. Although the application of core needle biopsy has increased greatly, reports in the literature and guidelines show that FNA is still a useful method for diagnosing breast diseases[4]. All palpable masses are suitable for FNA, and there are few contraindications to FNA for breast masses[5]. After mastectomy and mass resection, especially during and after radiotherapy, there are extensive lesions in the breast and surgical scar area, most of which are benign. FNA smears help to achieve a quick diagnosis and prevent further surgery. The preparation of cell block (CB) and immunohistochemistry (IHC) is increasingly regarded as a useful tool in providing a reliable diagnosis in resource-limited settings[6]. In this article, we report a rare case of melanoma which was initially diagnosed in breast by FNA. In this case report, we review the cytomorphology of melanoma on FNA cytology and highlight the significance of uncommon lesions in breast FNA smears.

Case Presentation

A 57-year-old female presented with a painless breast mass. Mammography showed a round and high-density nodular in right breast with a possibility of malignancy(Figure 1A). On clinical examination, the

patient had a suspect palpable mass (1.5 cm in diameter) in the upper outer quadrant of the right breast. There was no further information available. FNA biopsy was performed by using our patented 21-gauge (0.8 mm) aspirator (Youyi aspirator) as previous report[7]. The sample material was macroscopically dark and therefore highly suggestive of melanocytic pigmentation. Smears were cellular, consisting of tightly cohesive clusters of breast ductal cells and scattered atypical cells, which were of big size with high nuclear to cytoplasmic ratio, round to oval nucleus, and evenly distributed coarse chromatin and conspicuous nucleoli. Some of these atypical cells showed abundant cytoplasm and granular cytoplasmic pigment(Figure 1B). Therefore, a possibility of malignant big cell tumor was considered. The tumor cells are large and mostly lobated or histiocytoid clear nuclei. The cytoplasm is vacuolated or granular. Cytomorphological features and suspicious melanocytes are conducive to the diagnosis of malignant melanoma, which needs to be distinguished from undifferentiated non-epithelial tumors or anaplastic large cell carcinoma. In addition, pigmented melanoma should raise no diagnostic problems except in rare cases of carcinoid tumors that exhibit nuclear polymorphism and melanin production. Cell block and immunohistochemical analysis were performed to obtain the right diagnosis. Melanoma cells were negative for cytokeratin (Figure 1D) and melanoma markers HMB45 and MART-1 were positive(Figure 1E-F).

Subsequently, through detailed inquiry and physical examination, a mass (2.0 cm in diameter) with slightly dark skin color was found in the right lower limb (Figure 2A). In the past year, the patient had unexplained foot and ankle fractures. In addition, physical examination showed two 2 cm masses in the right groin(Figure 2B). A pigmented nevus was also found on the sole of the patient's right foot. The plantar nevus had a large area (2x0.5cm) and a serrated arc at the edge, which were consistent with the appearance of malignant melanoma (Fig. 2C). FNAs from lower limb mass and groin mass were performed. Smears are cellular and contain singly scattered plasmacytoid cells with brown to black pigment(Figure 2D-E). The melanoma cells are discohesive, containing densely packed yellow-brown stained pigment granules of the cytoplasm. The nuclei are enlarged and eccentrically located and contain macronuclei. Nuclear pseudo-inclusions are common(Figure 2F). Since the patient had a clear history of fracture, MRI showed melanoma involvement of bone. Thus, the overall features were those of melanoma involving breast, lymph node and bone marrow. The patient refused further treatment because she had no serious clinical symptoms. However, the patient succumbed to the disease a few months after she was discharged from the hospital.

Discussion

Benign and primary malignant breast tumors are quite common, but melanoma involvement of breast is only seen in 1.3%-2.7% of all malignant mammary tumors[8]. Melanoma is the most rapidly increasing cancer and 20% of patients diagnosed with melanoma will develop metastasis via hematologic or lymphatic routes[9]. Sometimes it can present many years after the primary diagnosis[10]. Breast metastases may be asymptomatic and/or palpable as well-defined nodules. On mammography, breast metastases showed clear nodular shadows without calcification or structural deformation. Therefore, clinical history, cytology and histology are very important for diagnosis.

According to our experience and literature report[10], cytoplasmic melanin pigment allowed a highly suggestive of breast metastases, therefore histological examination was not required. It should be emphasized that melanin must exist in malignant cells because hemosiderin simulates melanin in macrophages to a certain extent. The pigmented epidermotropic form of breast carcinoma can also mimic a melanoma[11]. However, although characteristic, the pigment is often not visible in cytological samples. Metastatic melanoma can also simulate a variety of cellular and architecture phenotypes, including primary breast malignancies[12]. Thus, a panel of biomarkers played a vital role in establishing the melanocytes originate of tumor cells. Immunohistochemistry for S100, HMB45, or Melan-A help to confirm the diagnosis.

Cutaneous melanoma is one of the tumors with a high frequency of dissemination to the breast. The prognosis for a patient with a newly diagnosed cutaneous melanoma depends mainly on the thickness of the primary tumour and the presence or absence of metastasis[13]. Due to the poor prognosis of patients with metastatic melanoma, active surgical treatment should be avoided. With regard to chemotherapy, ipilimumab, vemurafenib, interferon alfa-2b, dacarbazine and interleukin-2 have low response rates and are associated with serious adverse events[14]. Due to the low radio-sensitivity of melanoma cells, radiation therapy plays a limited role in the control of the natural history of metastatic melanoma[15]. However, the treatment of metastatic melanoma has been modified by the introduction of targeted therapy and immunotherapy. Treatments by using selected BRAF inhibitors combined with mitogen-activated protein kinase inhibitors have significantly improved response and overall survival[16]. Antibodies that block immune checkpoint proteins, including CTLA4, PD-1, and PD-L1 are FDA approved for treating melanoma[17]. While these therapies have limitations, identifying biomarkers to improve patient selection and discovering future therapeutic targets will hopefully lead to further treatment advances.

Conclusion

In conclusion, we report a rare case of a 57-year-old female with metastatic melanoma which was initially diagnosed in breast by fine needle aspiration. If a diagnosis of melanoma is suspected, performing immunohistochemistry is critical for confirming the diagnosis. Any melanoma patient with breast metastasis should be carefully examined for a history of cutaneous malignant melanoma. In summary, morphological evaluation on cytology, ancillary testing on cell block and meticulous clinical examination play a pivotal role in establishing the correct diagnosis.

Abbreviations

FNA: Fine needle aspiration

CB: Cell block

IHC: Immunohistochemistry

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Written informed consent was obtained from the patient for publication. All authors are in agreement for the publication of the study.

Availability of data and materials

All data and material were presented in this published article.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

All authors were involved in clinical and pathological findings of the lesions. Yan Yang and Miao Wang were the major contributors in writing the manuscript. All authors read and approved the final manuscript.

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Figures

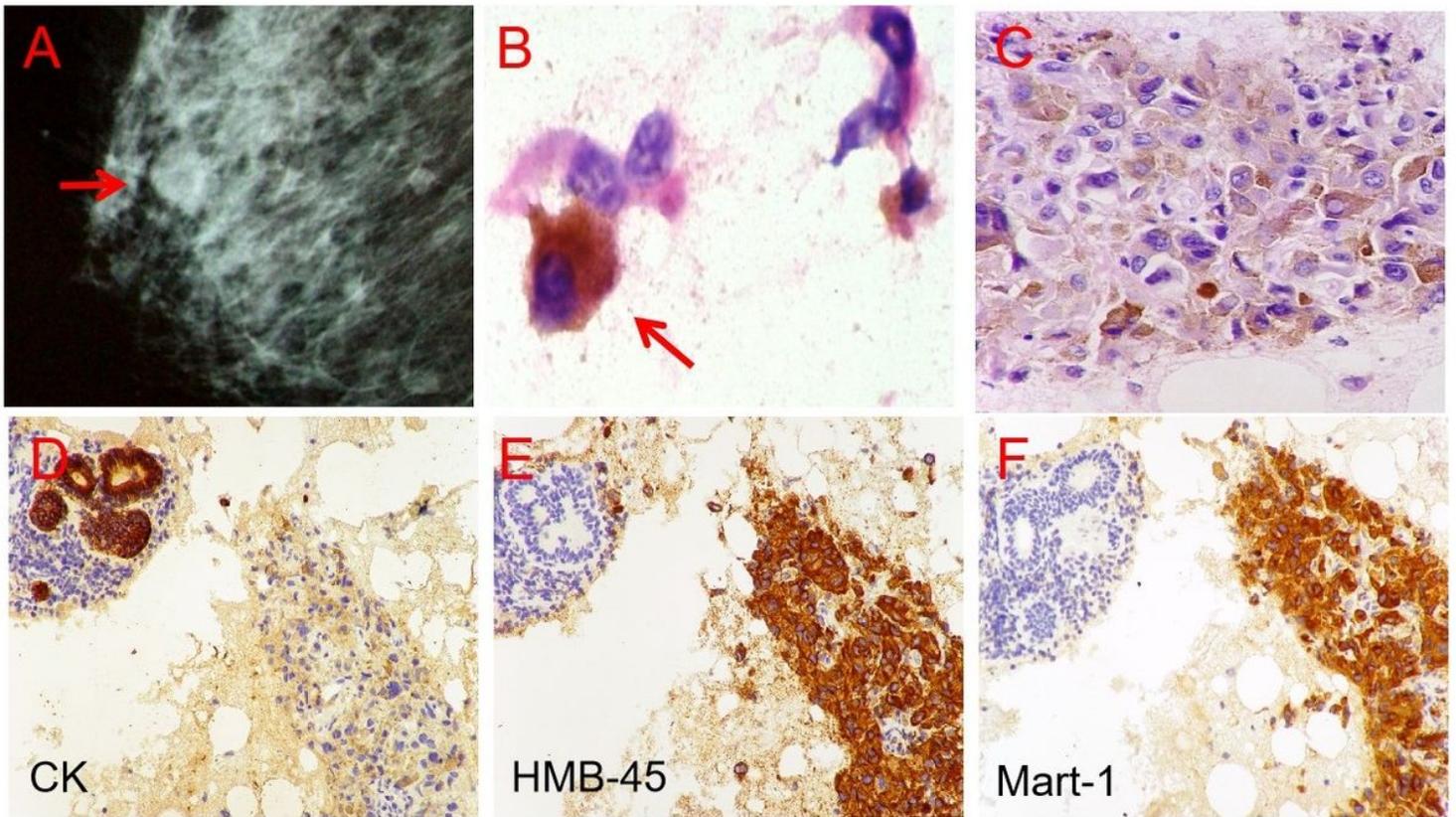


Figure 1

Melanoma in breast. A. Mammography showed a round and high-density nodular in right breast. B. Cytoplasmic pigment in tumor cells. (HE stain, 1000×). C. Marked nuclear pleomorphism and distinct cytoplasmic pigment on cell block section. (HE stain, 400×). D. Breast ductal epithelial demonstrating positivity to CK. (IHC stain, 200×). E-F. Melanoma demonstrating positivity to HMB-45 and Mart-1. (IHC stain, 200×).

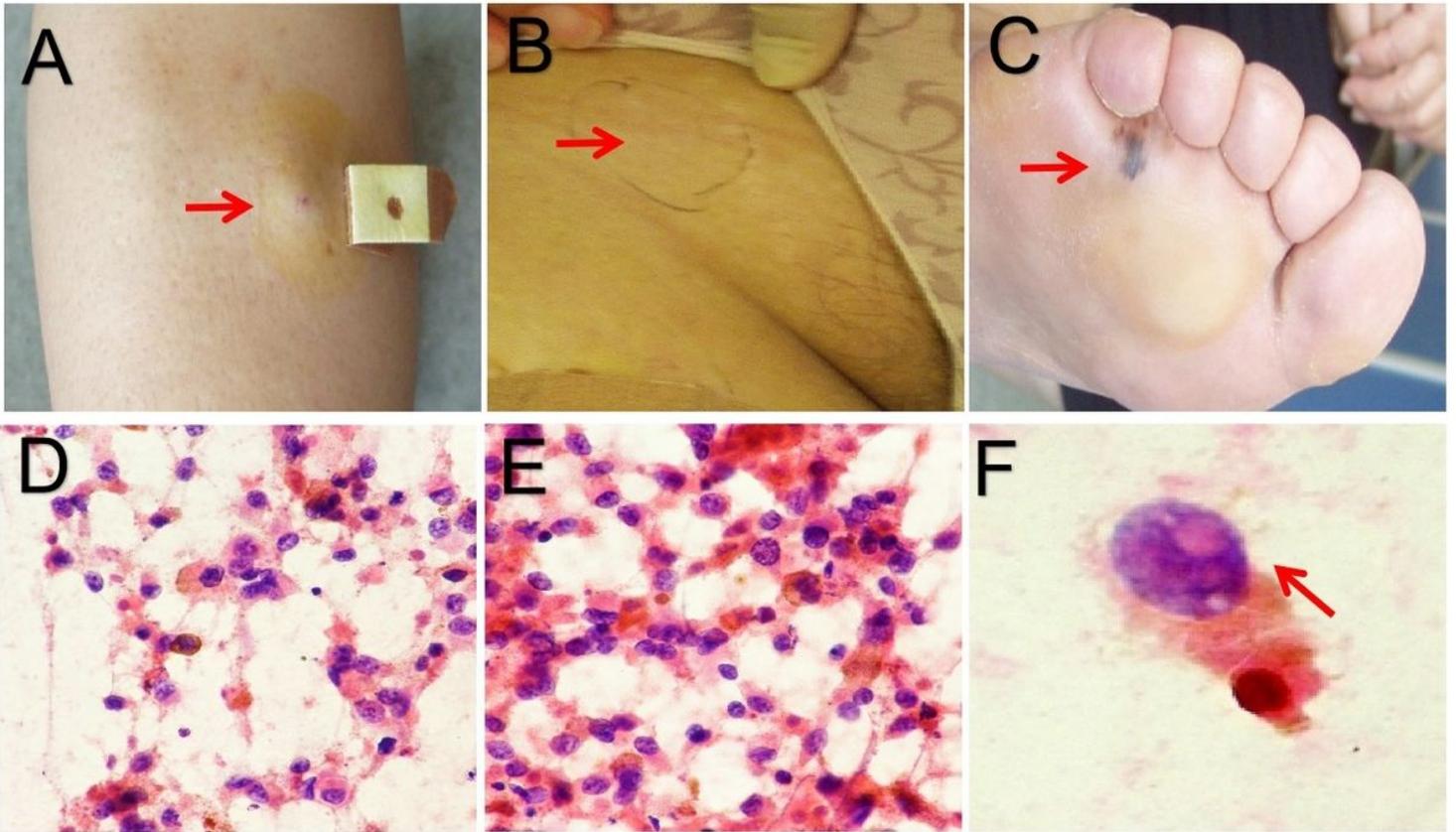


Figure 2

Plantar melanoma. A-B. Lump in lower extremity and groin. C. Dark pigmented lesion at plantar. D-E. Correlating FNA smear showed cytoplasmic pigment within tumor cells. (HE stain, 400×). F: Nuclear inclusions in the tumour cell (arrow). (HE stain, 1000×)

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