

# A possible pitfall of Mohs surgery in collision tumor diagnosis: A case of a squamous cell carcinoma of the scalp overlying a metastatic breast lesion of the skull



Annie J. Tsay, MPH,<sup>a</sup> Allison R. Paine, MD,<sup>b</sup> Jessyka G. Lighthall, MD,<sup>c</sup> Karen Y. Choi, MD,<sup>d</sup> Jeanette Hebel, MD,<sup>e</sup> and Alexandra Flamm, MD<sup>b</sup>  
Hershey and Lancaster, Pennsylvania

**Key words:** breast cancer metastasis; collision tumor; Mohs surgery pitfall in diagnosis; squamous cell carcinoma.

## INTRODUCTION

Collision tumors are a rare and often difficult-to-diagnose type of cutaneous neoplasms. Here, we present a case of a 77-year-old woman with a collision tumor initially described as a squamous cell carcinoma (SCC) of the scalp, but further investigation with Mohs surgery and histopathologic evaluation showed that it was a collision tumor between an SCC of the scalp and a metastatic breast carcinoma. Although collision tumors involving SCCs have been discussed in the literature, few have reported the specific involvement between cutaneous SCCs and breast cancer metastases, and to our knowledge, none have been reported in the scalp.

## CASE REPORT

A 77-year-old woman with a history of stage IIIA infiltrating lobular carcinoma of the breast, initially in 1998 and subsequently in 2013 (currently in remission), presented to her dermatologist with a 1-year history of a crusted plaque of the right side of the vertex aspect of the scalp (Fig 1). Shave biopsy of the lesion showed a well-differentiated invasive SCC, transected at the base of the specimen. Two smaller lesions on her scalp were biopsied, determined to be SCC in situ, and treated with electrodesiccation and curettage (not shown).

### Abbreviations used:

DCIS: ductal carcinoma in situ  
ER: estrogen-receptor  
IDC: infiltrating ductal carcinoma  
SCC: squamous cell carcinoma

Two months later, the patient underwent Mohs surgery. Three stages of Mohs surgery were performed without obtaining clear margins because of calvarial involvement at the deep margin, including periosteum (Fig 2). As such, she was referred to the otolaryngology department for oncologic management of the calvarium and closure of the large scalp defect.

Intraoperatively, evaluation of the wound showed a 1.0 × 1.0-cm soft tissue mass extending nearly full thickness through the cranium, leaving a thin layer of inner table between the tumor and the uninvolved dura excised as the deep margin. Permanent pathology specimens were sent for analysis, and the scalp defect was closed in an O-to-Z fashion. These sections displayed a proliferation of atypical cells with areas of glandular differentiation (Fig 3, A). Results were negative for p63 and positive for cytokeratin AE1-3, cytokeratin 7, and GATA-3, consistent with a diagnosis of metastatic breast carcinoma (Fig 3, B). Additional stains showed estrogen receptor, progesterone receptor positivity,

From the Penn State College of Medicine, Hershey<sup>a</sup>; Department of Dermatology,<sup>b</sup> Section of Facial Plastic and Reconstructive Surgery,<sup>c</sup> and Division of Otolaryngology-Head and Neck Surgery, Penn State Milton S. Hershey Medical Center<sup>d</sup>; and Dermatology Associates of Lancaster.<sup>e</sup>

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Correspondence to: Alexandra Flamm, MD, Assistant Professor of Dermatology and Pathology, Penn State Milton S. Hershey

Medical Center, 500 University Dr, Mail Code HU14, Hershey, PA, 17033. E-mail: [E-aflamm@pennstatehealth.psu.edu](mailto:E-aflamm@pennstatehealth.psu.edu).

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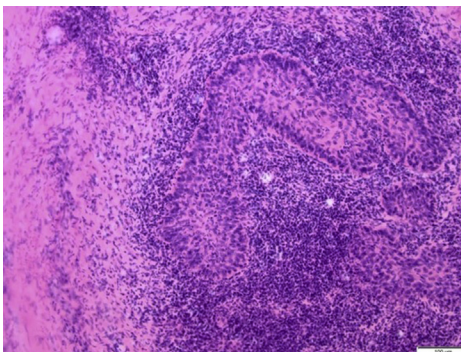
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**Fig 1.** Preoperative image showing crusted pink plaque located on the right superior parietal scalp of this 77-year-old woman with a history of breast cancer.



**Fig 2.** Frozen sections from Mohs surgery showing the superficial portion of the tumor containing lobules of atypical keratinocytes consistent with SCC without evidence for metastatic breast cancer (hematoxylin-eosin stain; original magnification:  $\times 10$ ).

and negative Her-2-Neu amplification. With this diagnosis, re-review of external Mohs slides was performed, and the deeper sections showed similar differentiation (Fig 3, C).

Of note, 1 day before surgery, the patient presented to the emergency department with abdominal and left-sided flank pain. A contrast-enhanced computed tomography scan of the abdomen and pelvis showed numerous peripheral enhancing lesions throughout the liver. Further imaging also showed multifocal osseous lytic lesions in the lumbar spine and calvarium, suggestive overall of metastatic disease.

## DISCUSSION

Here, we discuss a rare case of a collision between a metastatic breast cancer cranial lesion and an

overlying SCC of the scalp. Despite knowing the patient's history of breast cancer, the final diagnosis was unexpected given her duration of remission.

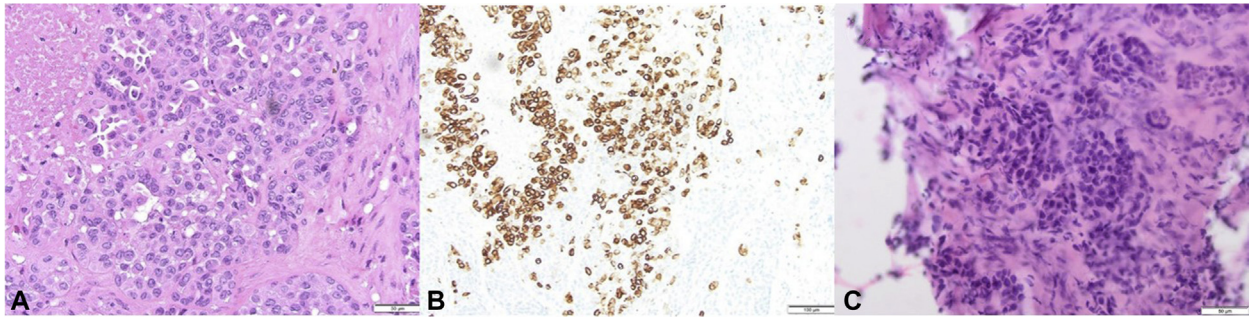
As noted, collision tumors between SCC and breast carcinoma metastases have rarely been reported. Other reported collision tumors have been described between ductal carcinoma in situ (DCIS) of anogenital mammary-like glands and vulvar sarcomatoid SCC in the vulva,<sup>1</sup> infiltrating ductal carcinoma (IDC) and SCC of skin overlying the breast,<sup>2</sup> primary lung cancer and metastatic breast cancer in the lungs on breast cancer follow-up,<sup>3</sup> and SCC arising in a mature cystic teratoma of the ovary.<sup>4</sup>

Although few reports documenting a collision between a cutaneous SCC overlying a metastatic breast cancer lesion exist, a common discussion topic emerges: specifically, determining if the tumors are independent entities or aberrant transformations of the primary tumor. This is discussed in a case of a collision of DCIS of anogenital mammary-like glands and vulvar sarcomatoid SCC<sup>1</sup> and in a case of a collision of SCC and IDC overlying the breast, which did not show histologic transformation of the IDC into SCC.<sup>2</sup> Finally, another article reported 2 cases of this collision effect between a primary SCC of the lung and metastatic ductal breast carcinoma.<sup>3</sup>

One hypothesis for the etiology of these lesions is that aberrant genetic mutations may lead to multiple tumors in the same site due to overexpression or underexpression of cell cycle markers. Filippakis et al<sup>4</sup> suggest that collision tumors could result from genetic mutations such as the overexpression of p53.

Our case also illustrates the diagnostic challenges of identifying collision tumors using Mohs surgery alone. Although Mohs is an effective technique for preserving skin in sensitive areas and treating complicated skin malignancies, it has several limitations dependent on technique and technical experience. Limitations can include poor-quality frozen section tissue compared with permanent sections due to limited fixation time, cryostat knife temperature above optimal level, thickness of the frozen section ( $>3$  mm sections can affect visualization of cells), folds in tissue, holes in tissue affecting the ability to determine a positive margin, and the extent of disease.<sup>5,6</sup> Two additional diagnostic pitfalls of Mohs surgery highlighted in our case involve the diagnosis of tumor collisions deep in the margin and difficulty differentiating tumor cell types on frozen section.<sup>5</sup> As a result, it becomes difficult to tell if the tumor is composed of 2 independent entities or if 1 tumor invaded the other entity.

Cases like this highlight the importance of integrating clinical history with pathologic suspicion about the possibility of a metastatic breast cancer



**Fig 3.** Re-exploration of the scalp defect. **A**, Biopsy sample showing atypical cells similar to those seen on Mohs frozen sections, with areas of glandular differentiation suggestive of underlying breast metastasis (hematoxylin-eosin stain; original magnification:  $\times 20$ ). **B**, Biopsy specimen showing cytokeratin-7 positivity (immunohistochemical stain; original magnification:  $\times 10$ ). **C**, The deeper Mohs frozen section showing pleomorphic atypical cells lacking keratinization consistent with metastatic breast cancer (hematoxylin-eosin stain; original magnification:  $\times 20$ ).

lesion. Clinicians should have a low threshold of suspicion for metastatic malignancy in a cutaneous-appearing skin lesion that does not have clean margins in a patient with a remote history of cancer. Identification of collision tumors would benefit from permanent sections with the incorporation of appropriate immunohistochemical stains to determine the etiology of the malignancy if margin slides appear equivocal and warrant further investigation.

To our knowledge, this is one of only rare reports of a patient with a cutaneous SCC overlying an incidentally found metastatic breast carcinoma in the calvarium believed to be in remission. This case highlights the importance of maintaining a low threshold of suspicion for diagnosing collision tumors in a patient with a known history of cancer in the setting of 2 distinct morphologies identified on Mohs sections.

#### REFERENCES

1. Tran TA, Deavers MT, Carlson J, Malpica A. Collision of ductal carcinoma in situ of anogenital mammary-like glands and vulvar sarcomatoid squamous cell carcinoma. *Int J Gynecol Pathol.* 2015;34:487-494.
2. Geetha RK, Kalyani R, Srinivas MV, Shakthidasan C. A rare collision tumour of infiltrating ductal carcinoma and squamous cell carcinoma of skin overlying breast: a case report. *J Clin Diagn Res.* 2015;9:XD06-XD08.
3. Piacentini FR, Rossi G, Casali C, Cadioli A, Barbieri E, Valentina G. Primary pulmonary cancer colliding with metastatic breast carcinoma: hitherto unreported cases of cancer-to-cancer metastasis focusing on clinical implications. *Lung Cancer.* 2011;74:145-148.
4. Filippakis GL, Lagoudianakis EE, Genetzakis M, et al. Squamous cell carcinoma arising in a mature cystic teratoma of the ovary with synchronous invasive lobular breast cancer: case report. *Eur J Gynaecol Oncol.* 2006;27:537-540.
5. Rapini R. Pitfalls of Mohs micrographic surgery. *J Am Acad Dermatol.* 1990;22:681-686.
6. Bouzari N, Olbricht S. Histologic pitfalls in the Mohs technique. *Dermatol Clin.* 2011;29:261-272.