CASE REPORT

Tumour-to-Tumour Metastasis from a Carcinoma of the Breast to a Pleomorphic Adenoma of the Parotid Gland

Vittoria Perrotti, DDS, PhD, Massimiliano Fioroni, DDS, Corrado Rubini, MD, Edoardo Stellini, MD, DDS, and Adriano Piattelli, MD, DDS

In 1902, Berent reported for the first time a case of tumour-to-tumour metastasis, specifically, a case of metastasis from a primary squamous carcinoma of the jaw to a renal cell carcinoma.[1] Since then, about 50 cases of tumour-to-tumour metastases have been reported in the literature.[2]

The coexistence of multiple primary malignant tumours in the same patient is not unusual, whereas tumour-to-tumour metastasis is rare.[2–6] The criteria to diagnose a tumour-to-tumour metastasis must be very strict[2]:

1. the presence of more than one primary tumour must be proven
2. the recipient tumour must be a true neoplasm
3. it must be a true metastasis with established growth and invasion into the recipient tumour

The most common donor site is the lung, followed by the breast, gastrointestinal tract, prostate, and thyroid. According to Campbell and colleagues' criteria, the recipient neoplasm may be benign or malignant.[7] Of the malignant recipients, renal cell carcinoma is by far the most common recipient,[2,3,8] followed by sarcomas, meningiomas, thyroid tumours, and pituitary tumours. This could be related to the rich vascular supply of renal cell carcinoma[2,5,9] and its high lipid and glycogen content.[3] Benign tumours, which generally proliferate slowly and are often unnoticed for a long period, are possible recipients of tumour-to-tumour metastasis.[4]

A metastasis from breast carcinoma to another tumour has rarely been reported.[10] Owing to the rarity of this occurrence, we report a case of a tumour-to-tumour metastasis from a breast carcinoma to a pleomorphic adenoma of the parotid gland.

Case Report

A 78-year-old female patient underwent a right total mastectomy with lymphadenectomy for poorly differentiated infiltrating ductal carcinoma (grade 3 according to Elston-Ellis) (Figure 1) and lymph node metastases. After 1 year, a chest radiograph and a computed tomographic scan showed the presence of lung metastases. The patient underwent a cycle of chemotherapy with a significant reduction in the lesions. After another year, the patient presented to our department, complaining about a mass located in the preauricular area, which appeared about 3 months earlier. The mass was growing slowly. At the

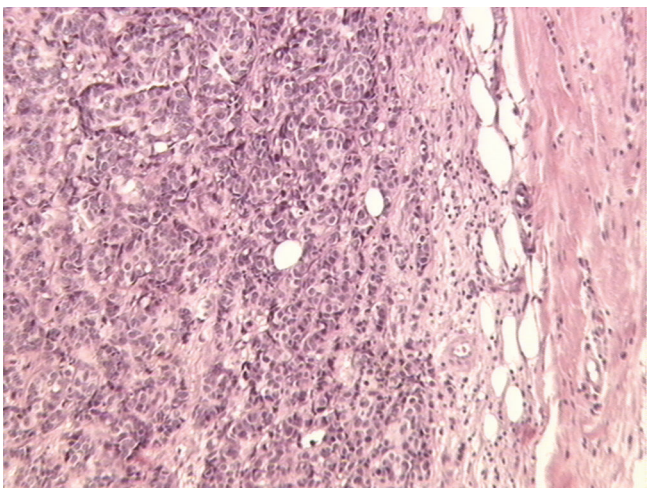

Figure 1. Primary breast cancer with features of poorly differentiated infiltrating ductal carcinoma (hematoxylin-eosin stain; original magnification ×160).

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Vittoria Perrotti *and* Adriano Piattelli: *Dental School, University of Chieti-Pescara, Chieti, Italy;* Massimiliano Fioroni: *Dental School, University of Ancona, Ancona, Italy;* Corrado Rubini: *Institute of Pathologic Anatomy and Histopathology, University of Ancona, Ancona, Italy; and* Edoardo Stellini: *Dental School, University of Padova, Padova, Italy.*

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Address reprint requests to: Vittoria Perrotti, DDS, PhD, *via dei Vestini 31m, 66100 Chieti, Italy; e-mail: v.perrotti@unich.it.*

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clinical examination, the skin covering the area had a normal appearance, and on palpation, the mass had a hard elastic consistency. No pain was present. The patient underwent fine-needle aspiration biopsy, which showed the typical features of pleomorphic adenoma. A total right parotidectomy was then performed. Macroscopically, it was possible to observe a 4 × 3 cm nodule surrounded by a thin fibrous capsule, whitish on the cut section, with a myxoid aspect and a hard elastic consistency. Microscopically, the lesion was composed of a pleomorphic adenoma infiltrated by foci of carcinoma, in both in subcapsular (Figure 2 and Figure 3) and central areas (Figure 4). Moreover, foci of epithelial cells with clear atypia (Figure 5) were observed. These neoplastic islands were positive for cytokeratins and negative for smooth muscle actin, vimentin, and S-100 protein, whereas the myoepithelial component of the pleomorphic adenoma was positive for smooth muscle actin and S-100 protein. The nests of carcinoma were positive for estrogens (Figure 6) and progesterone, whereas there was positivity for cErbB2 of the myoepithelial component of the pleomorphic adenoma and of the carcinoma. The definitive diagnosis was breast ductal carcinoma metastatic to a pre-existing pleomorphic adenoma of the parotid gland. At the 18-month follow-up, there was no evidence of other metastatic lesions.

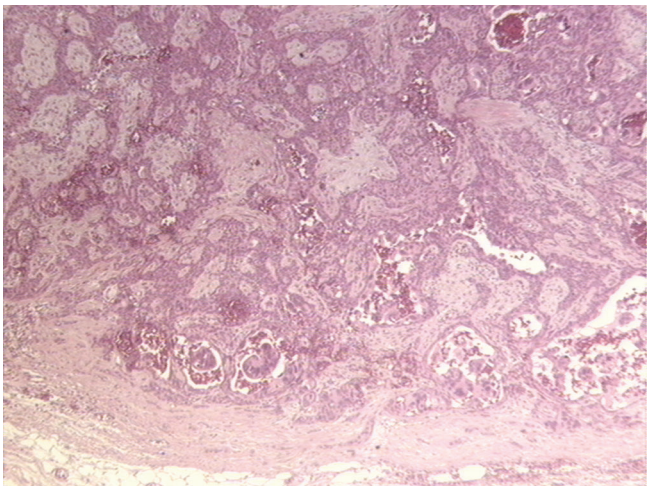

Figure 2. A pleomorphic adenoma surrounded by a fibrous capsule with foci of carcinoma in the subcapsular area can be seen (hematoxylin-eosin stain; original magnification ×100).

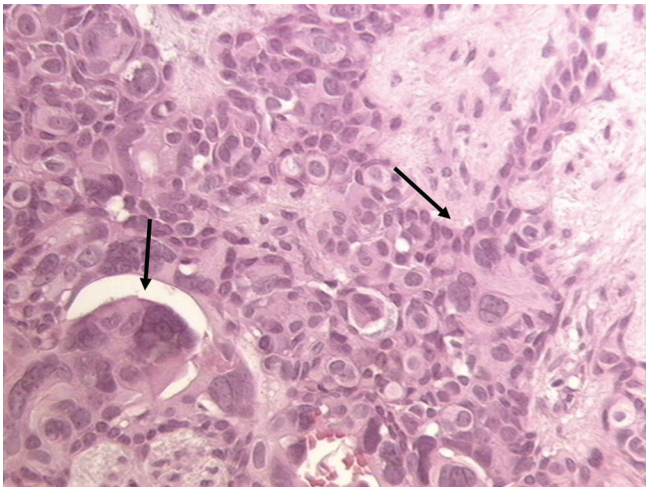

Figure 4. Nests of neoplastic cells with wide cytoplasm (*arrows*); these cells are infiltrating the myoepithelial cells of the pleomorphic adenoma (hematoxylin-eosin stain; original magnification ×400).

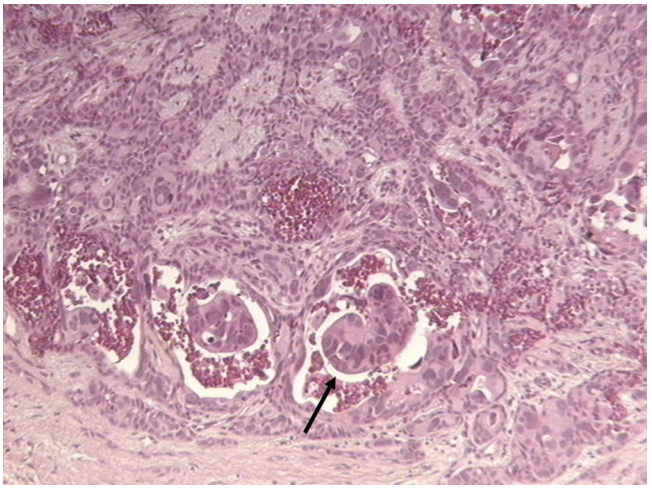

Figure 3. The lesion is composed of a pleomorphic adenoma infiltrated by foci of carcinoma (*arrow*) (hematoxylin-eosin stain; original magnification ×200).

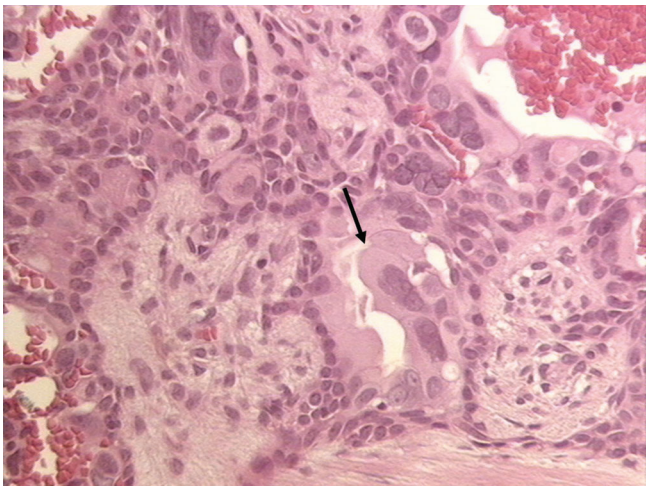

Figure 5. Foci (*arrow*) of neoplastic epithelial cells with evident atypia (hematoxylin-eosin stain; original magnification ×400).

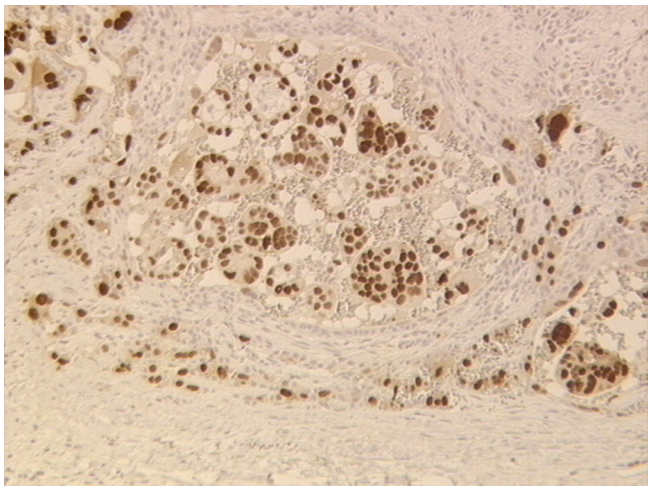

Figure 6. It is possible to observe nests of carcinoma with positivity for estrogens surrounded by estrogen-negative neoplastic cells of pleomorphic adenoma (estrogen staining; original magnification ×160).

Discussion

In this report, a rare case of tumour-to-tumour metastasis has been presented.

Following the guidelines that we reported,[2] collision tumours, contiguous spread from malignant tumours involving neighbouring organs, and metastasis to lymphomatous or leukemic lymph nodes are excluded.[2]

It has not been established whether tumour-to-tumour metastasis is a random occurrence or is due to selective lodging, survival, and growth within another malignant neoplasm.[10] Two hypotheses on the pathophysiology of tumour-to-tumour metastasis have been proposed:

1. The ''mechanical'' theory, proposed by Ewing, suggests that metastatic patterns depend on the number of viable tumour cells reaching the target organ, which is influenced by factors such as high blood flow or high tumour vascularity.[11]
2. The ''seed-and-soil'' theory, proposed by Paget, suggests that tumour development is the consequence of the provision of the environment (''soil'') in which neoplastic receptive cells (''seed'') proliferate.[12,13]

One of the pitfalls in the diagnosis of tumour-to-tumour metastasis is represented by the similarity of growth patterns between the donor and recipient tumours, as, for example, in renal cell carcinoma metastasis in a thyroid carcinoma[9] or a prostatic adenocarcinoma in a primary solid papillary carcinoma of the male breast.[14]

Renal cell carcinoma appears to be the most common malignant recipient and meningioma the most common benign recipient of metastases, whereas lung, breast, and gastrointestinal tract carcinomas present as the most frequent donor tumours.[9,15–22] This latter feature might be explained by the generally high incidence of these tumours in the population and by their marked tendency toward metastatic spread.[9]

In our case, all of the criteria to diagnose a tumour-to-tumour metastasis were fulfilled because the presence of more than one primary tumour was proven, the recipient tumour was a true neoplasm, and it was a true metastasis with established growth and invasion into the recipient tumour.

References

1. Berent W. Seltene Metastsenbildung. Zentralbl Allg Pathol 1902;13:406.
2. Petraki C, Vaslamatzis M, Argyrakos T, et al. Tumor to tumor metastasis: report of two cases and review of the literature. Int J Surg Pathol 2003;11:127.
3. Arnould L, Franco N, Soubeyrand MS, et al. Breast carcinoma metastasis within granulose cell tumor of the ovary: morphologic, immunohistologic, and molecular analyses of the two different tumor cell populations. Hum Pathol 2002;33:445.
4. Baloch ZW, LiVolsi VA. Tumor-to-tumor metastasis to follicular variant of papillary carcinoma of the thyroid. Arch Pathol Lab Med 1999;123:703.
5. Hamazaki S, Nakashima H, Matsumoto K, et al. Metastasis of renal cell carcinoma to central nervous system hemangioblastoma in two patients with von Hippel-Lindau disease. Pathol Int 2001;51:948.
6. Georgiadze T, Ward RM, Baloch ZW, Livolsi VA. Phyllodes tumor metastatic to thyroid Hurthle cell adenoma. An unusual tumor-to-tumor metastasis. Arch Pathol Lab Med 2002;126:1233.
7. Campbell LV Jr, Gilbert E, Chamberlain CR Jr, Watne AL. Metastases of cancer to cancer. Cancer 1968;22:635.
8. Ohmori K, Nishimura K, Nishizaka Y. A case of small cell lung cancer metastasizing to prostatic cancer. Urol Int 1998;60:251.
9. Ryska A, Cap J. Tumor-to-tumor metastasis of renal cell carcinoma into oncocytic carcinoma of the thyroid. Report of a case and review of the literature. Pathol Res Pract 2003;199:101.
10. Andersen HJ, Hansen LG, Paulsen SM. Metastasis of cancer to cancer. A case of breast carcinoma metastasizing to a malignant mesothelioma. Thorac Cardiovasc Surg 1986;34:258.
11. Ewing J, editor. Neoplastic disease: a treatise on tumors. 3rd ed Philadelphia: WB Saunders; 1928;.
12. Paget S. The distribution of secondary growth in cancer of the breast. Lancet 1989;1:571.
13. Kameyama K, Kamio N, Okita H, Hata J. Metastatic carcinoma in follicular adenoma of the thyroid gland. Pathol Res Pract 2000;196:333.
14. Sahoo S, Smith RE, Potz JL, Rosen PP. Metastatic prostatic adenocarcinoma within a primary solid papillary carcinoma of the male breast. Application of immunohistochemistry to a unique collision tumor. Arch Pathol Lab Med 2001;125:1101.
15. Alonso S, Rodriguez-Peralto JL, Perez-Espejo G. Metastasis of cutaneous malignant melanoma to angiolipoma: the tumor-to-tumor metastasis phenomenon. J Cutan Pathol 2003;30:323.

16. Wong A, Koszyca B, Blumbergs PC, et al. Malignant melanoma metastatic to a meningioma. Pathology 1999;31:162.
17. Bhargava P, McGrail KM, Manz HJ, Saidas S. Lung carcinoma presenting as a metastasis to intracranial meningioma: case report and review of the literature. Am J Clin Oncol 1999;22:199.
18. Khurana KK, Powers CN. Basaloid squamous carcinoma metastatic to renal-cell carcinoma: fine needle aspiration cytology of tumor-to-tumor metastasis. Diagn Cytopathol 1997;17:379.
19. Perry LJ, Lewis JC, Ball RY. Adenocarcinoma of the breast metastatic to benign ovarian fibromas. Gynecol Oncol 1996;62:408.
20. Koyama T, Matsumori M, Nakamura K, Fujimori T. Metastasis of cancer to cancer: report of a case of esophageal carcinoma metastasizing to early gastric cancer. Jpn J Surg 1991;21:352.
21. Franke FE, Altmannsberger M, Schachen Mayr W. Metastasis of renal carcinoma colliding with glioblastoma. Carcinoma to glioma: an event only rarely detected. Acta Neuropathol (Berl) 1990; 80:448.
22. Brown HM, McCutcheon IE, Leeds NE, et al. Melanoma metastatic to central neurocytoma: a novel case of tumor-to-tumor metastasis. J Neurooncol 2003;61:209.

Authors Queries

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