

ASSOCIATION OF BREAST CARCINOMA AND MENINGIOMA: REPORT OF NINE NEW CASES AND REVIEW OF THE LITERATURE

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Nine patients with diagnosed breast cancer who developed meningiomas are reported. Articles suggesting that an association of these two tumors is possible. Some authors have noted hormonal sensitivity and the presence of hormonal receptors in some meningiomas. Since breast cancer is the mo-

st common tumor in women, an association between it and meningiomas might be fortuitous. However, it is important to fully investigate brain lesions in patients with breast cancer so that potentially curable meningiomas are not considered as metastases.

Key words: breast carcinoma, meningioma.

Breast cancer is a common neoplasm in women, accounting for 28% of all cancers^{2,23}. Likewise, meningiomas are common benign neoplasms encountered twice as often in women as in men. In 1975, an association between these two tumors was suggested by Schoenberg et al.²¹. Rubinstein et al.²⁰ reviewed numerous articles suggesting that an association of the two neoplasms is more common than expected. The occurrence of 9 such neoplasms in our Division over a 14-year period prompted the study.

Materials and methods

Between 1980 and 1993, 263 women with meningiomas were surgically treated in our Division (Table 1). Twenty of them had additional tumors that included 9 breast cancers, 5 genital cancers, 3 hematopoietic malignancies, 2 lung cancers and 1 melanoma.

Estrogen (ER) and progesterone receptor (PR) assays were carried out on routine sections of breast and meningeal tumors cut from field paraffin blocks. Sections of breast cancer and meningioma were rehydrated and initially digested using DNAase for 30 min at 37 °C, followed by incubation with primary monoclonal antibodies direct against ER and PR. All breast cancers were positive for ER, whereas only 2 were positive for PR. All meningeal tumors were negative for ER and 4 were positive for PR.

Breast cancer and meningiomas were classified and graded according to the WHO classification. The clinical and histologic characteristics and outcome of the 9 patients are reported in Table 2.

Table 1 - Site of occurrence of 263 meningiomas in female patients

Site	Total	Other tumors
Convexity	52	3
Sphenoid ridge	32	7
Parasagittal	64	4
Multiple sites	6	—
Parasellar	9	—
Falx	46	—
Olfactory groove	9	—
Other	45	7
Total	263	20

Discussion

Brain metastases are found in 37% to 57% of breast cancer patients at autopsy²⁴; meningiomas overall constitute 20% of all brain tumors. Burns et al.³ found that for every case of meningioma in patients with breast cancer, 54 had metastatic disease as the cause of their intracranial mass. Schoenberg et al.²¹, in an epidemiologic study of CNS neoplasms and primary malignancies in other sites from the Connecticut Tumor Registry, suggested that in the case of breast carcinoma and meningioma the number of observed second primary tumors exceeded the number expected (8 observed cases vs 3.7 expected cases, $P < 0.05$). However, Schoenberg et al.²¹ based the conclusions on a small number of cases ($n=8$) and comparisons of many tumor combinations. The association has been pointed out by Posner¹⁹ (study on 324 cases) and by other authors in individual

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Table 2 - Clinical and histologic characteristics and outcome of the 9 patients

Case no.	Age (yr), sex	Histology of the breast cancer	Treatment	Interval (yr) between breast tumor and meningioma	Site of meningioma	Histology of the meningioma	Treatment	Outcome (yr)
1	47 F	IDC	M-Ct	4	Left sphenoid ridge	Transitional	S	11 A
2	54 F	IDC	M-Ct	2	Right frontal ridge	Psammomatous	S	4 A
3	53 F	IDC	M-Ct	6	Right sphenoid ridge	Transitional	S	5 A
4	48 F	IDC	M-Ct	7	Left sphenoid ridge	Psammomatous	S	3 A
5	55 F	IDC	M-Ct	6	Left parietal ridge	Meningotheliomatous	S	1 A
6	49 F	IDC	M-Ct	1	Left sphenoid ridge	Transitional	S	2 A
7	61 F	IDC	M-Ct	2	Left sphenoid ridge	Meningotheliomatous	S	3 A
8	58 F	IDC	M-Ct	6	Left frontal ridge	Transitional	S	2 A
9	50 F	IDC	M-Ct	3	Right sphenoid ridge	Transitional	S	7 A

A, alive; IDC, infiltrating ductal carcinoma; M-Ct, mastectomy + chemotherapy; S, surgery.

reported cases^{6,11,13,16,17,20,21,23}. However, in larger meningioma series^{7,12,18,25} there was no mention of concurrent breast carcinoma and meningioma.

Both tumors occur in a similar age group (5th-6th decade). Onset and types of neurologic symptoms and signs cannot be used to distinguish between metastatic breast carcinoma and intracranial meningioma because they are similar^{1,9}. Computerized tomography (CT) and magnetic resonance imaging (MRI) may be useful (Table 3). The following findings are very important: on CT scan, metastasis of the breast is outward expansion of the gray/white matter junction rather than inward buckling by the extracranial meningioma; abundant surrounding cerebral edema is present with metastasis, whereas this is not common with meningioma; bone destruction, rather than hyperostosis, is suggestive of metastasis; on enhanced MRI meningiomas undergo intense enhancement with a small amount of linear enhancement along the dura adjacent to the tumor ("tail").

Previous studies have suggested an association because both are ER and PR positive in a high percentage of cases, both would appear to be hormone dependent for their development and growth, and both have been manifested as collision tumors, in which the breast carcinoma has metastasized to the meningioma. Many authors^{4,5,10} have recently documented that the ER/PR profile meningioma substantially differs from that customarily seen in breast cancer; unlike breast cancer, meningiomas are much more commonly positive for PR than for ER. Kozbor and Croce¹⁴ reported that amplification of the c-myc oncogene may be induced in both tumors; however, the c-myc oncogene is enhanced several-fold on exposure to estrogen. The human PR gene shares the same location as the mammary oncogene int-2 in chromosomal band 11q13¹⁵. Such a proximity is believed to explain the role of progesterone in breast cancer, but the role of oncogene, int-2 in the genesis of meningiomas is not yet known.

In 6 of our 9 women with breast cancer (66%), the

Table 3 - Clinical and neuroradiologic differences between metastasis from breast carcinoma and intracranial meningioma^{1,9}

	Meningioma	Metastasis
Symptoms		
Headache	36%	58%
Personality change	22%	22%
Paresis	19%	39%
Seizures	19%	19%
CT		
Non-enhanced	Isodense\slightly hyperdense	Variable with extensive edema
Enhanced	Intense-homogeneous	
MRI		
Non-enhanced	1=Isointense\mildly hypointense	1=Hypointense\variable
Enhanced	2=Isointense\mildly hyperintense Uniform with tail	2=Hyperintense\variable Dyshomogeneous

1=T1-weighted images; 2=T2-weighted images.

meningioma was found on the sphenoidal ridge. Compared with all meningioma patients (263 cases), those with breast cancer were more likely to have sphenoidal ridge meningiomas (67% vs 11%; $P=0.36$). All breast cancers were positive for ER, whereas only 2 were positive for PR. Our meningiomas were negative for ER, whereas 4 sphenoidal meningiomas were positive for PR. Such data confirmed the different ER\PR profile of tumors and the hypothesis that sphenoidal ridge meningioma and breast cancer may represent a unique constellation of neoplasms in women¹¹.

Associazione fra carcinoma della mammella e meningioma: descrizione di 9 nuovi casi e revisione della letteratura

Vengono descritte nove pazienti affette da tumore della mammella che, successivamente, hanno sviluppato un meningioma. La letteratura indica che l'associazione dei due tumori è possibile; alcuni autori, in particolare, sottolineano la sensibilità ormonale e la presenza di recettori ormonali nei meningiomi. Ciononostante, poiché il tumore della mammella è comune nelle donne adulte, l'associazione potrebbe essere fortuita. Tuttavia, è importante studiare attentamente le lesioni cerebrali nelle pazienti con tumore della mammella affinché un tumore curabile come il meningioma non sia considerato una metastasi.

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