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Case Report

Left homonymous hemianopia as an atypical manifestation of isolated pachymeningeal metastasis secondary to breast cancer: Case report and review of the literature ☆

Aziz Ahizoune, MD[a,], Moad Belouad, MD[b], Houda Alloussi, MD[a], Mohamed Allaoui, MD[c], Mohamed Hamid, MD[a], Ahmed Bourazza, MD[a]*

[a] *Department of Neurology and Neurophysiology, Mohammed V Military Teaching Hospital, University of King Mohammed V-Souissi, Rabat, Morocco*

[b] *Department of Gynecology and Obstetrics, Mohammed V Military Teaching Hospital, University of King Mohammed V-Souissi, Rabat, Morocco*

[c] *Department of Pathology, Mohammed V Military Teaching Hospital, University of King Mohammed V-Souissi, Rabat, Morocco*

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ABSTRACT

Breast cancer is the most frequently diagnosed cancer in women and is caused by the uncontrolled proliferation of breast cells. Metastases from breast cancer to the central nervous system have been described frequently in the literature, but dural metastases without cerebral parenchymal involvement are rarely reported. The latter condition is known as isolated pachymeningeal metastasis (IPM). Herein, we report the case of a 52-year-old female patient who presented left homonymous hemianopia secondary to a right occipital lobe injury which was compressed by a dural thickening identified on brain MRI. Etiological investigations revealed suspicious breast lesions on chest CT scan. Anatomopathological examination of these lesions was consistent with luminal breast cancer. The diagnosis of IPM following breast cancer was confirmed, and the patient underwent chemotherapy treatment.

☆ Competing Interests: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

* Corresponding author.
E-mail address: dr.aziz.ahizoune@gmail.com (A. Ahizoune).

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Introduction

Breast cancer (BC) is the most frequently diagnosed cancer in women and is caused by the uncontrolled proliferation of breast cells [1]. Patterns of breast cancer metastasis to the brain include different pathways such as: hematogenous, leptomeningeal, direct extension, perivascular, and perineural spread along the nerves. However, distant metastases to the dural meninges are rare, occurring in approximately 8%-9% of autopsied patients with advanced extraneural systemic cancer [2]. BC is the second most common cause of dural metastasis (16.5%) after prostate cancer (19.5%) [2].

Generally, There are 2 subtypes of meningeal carcinomatosis: leptomeningeal carcinomatosis, which is related to lesions of the pia mater and arachnoid membranes, and pachymeningeal carcinomatosis (PC) also known as dural carcinomatosis, in which the dura mater is affected [3]. The most commonly reported causes of PC are metastases from primary cancers. Isolated pachymeningeal metastasis (IPM) corresponds to metastatic invasion of the dura mater, without parenchymal involvement and is rarely described among patients with BC [3,4].

Parenchymal metastases are often symptomatic in comparison to dural lesions which are rarely symptomatic [4]. Manifestations of IPM are often due to either infiltration of the cranial nerve roots or the process of compression on the brain parenchyma [4]. Visual disturbances as a revealing feature of IPM secondary to BC are rarely reported in the literature. Homonymous hemianopia (HH) corresponds to a loss of vision affecting 2 vertical hemifields on the same side in both eyes and is indicative of retrochiasmatic damage [5]. Here, we

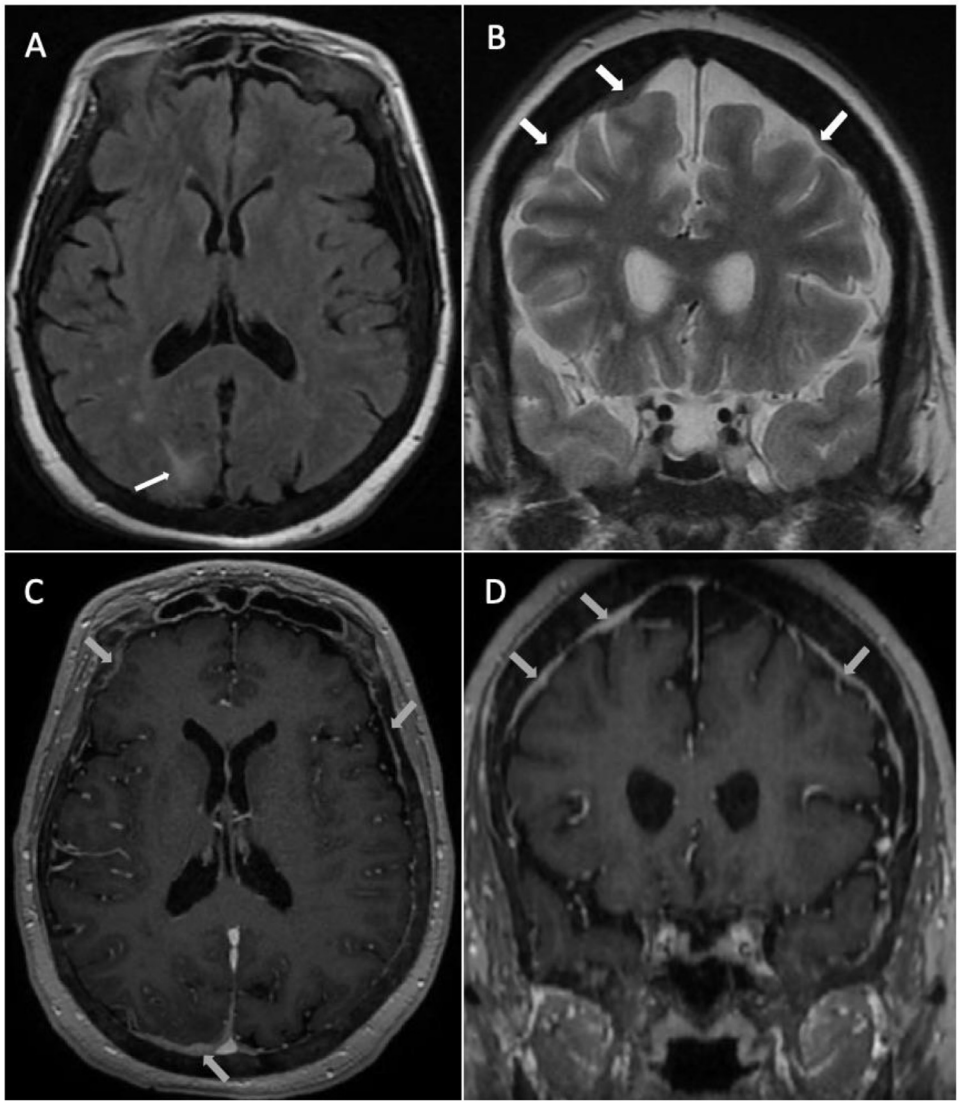

Fig. 1 – (A) Axial fluid attenuated inversion recovery (FLAIR) brain MRI sequence showing hyperintense signal in the right occipital lobe (white arrow) associated to a few nonspecific punctiform lesions. (B) Coronal T2-weighted image of brain demonstrating diffuse dural lesions which showing iso-signal intensity. (C, D) Postcontrast axial (C) and coronal (D) T1-weighted images showing diffuse dural meningeal enhancement (grey arrows) with significant thickening adjacent to the right occipital lobe, which is compressed.

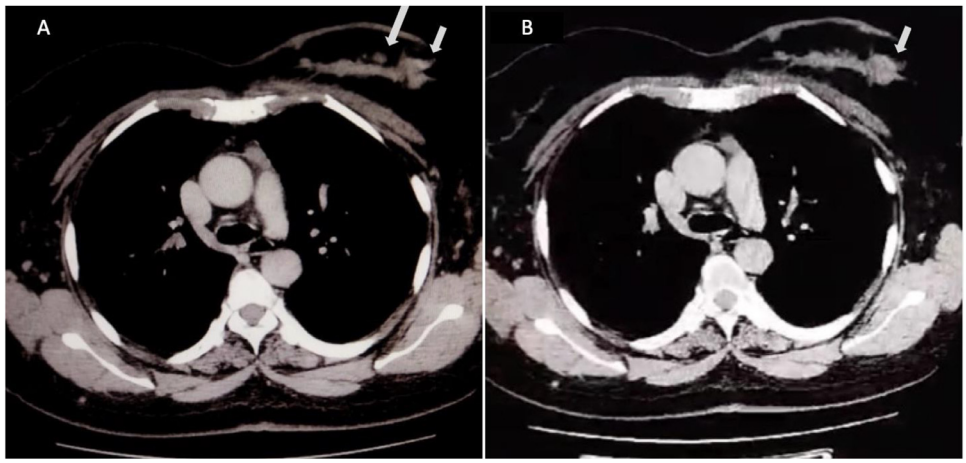

Fig. 2 – (A, B): Axial CT scan of the chest showing suspicious nodular lesions in the left breast (arrows).

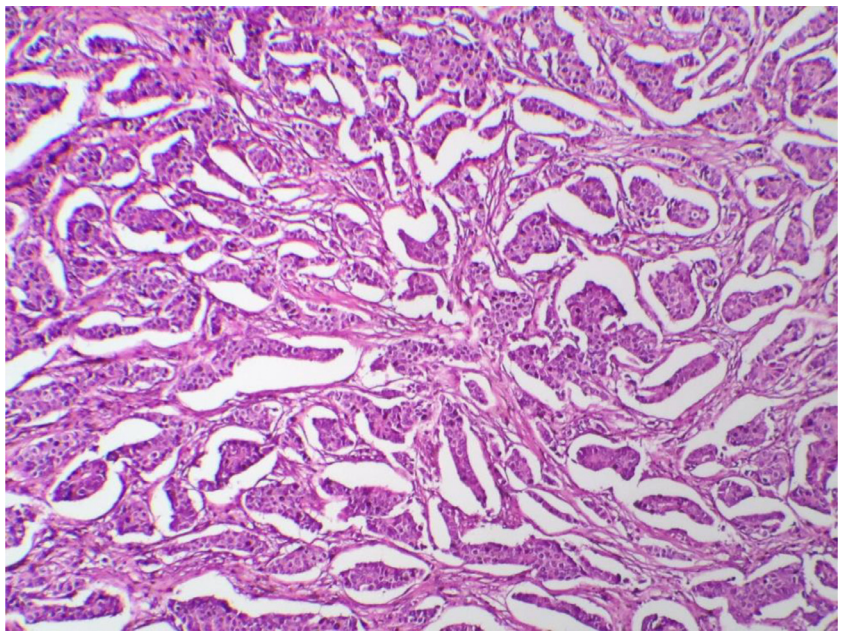

Fig. 3 – Invasive breast carcinoma of no special type, composed of cheets, nests and cords. The tumor cells are moderately atypical. The stroma is desmoplastic (HE, Gx100).

report the case of a 52-year-old female patient presenting with left HH (LHH) secondary to IPM from BC.

Observation

A 52-year-old right-handed, and postmenopausal woman with controlled arterial hypertension under amlodipine 5 mg per day, presented to the neurology department with a 3-month history of painless blurred vision of both eyes associated with moderate diffuse headache. The patient's symptoms evolved progressively without vomit, fever, or other neurologic symptoms.

On clinical examination, she was conscious, with a soft neck, normal blood pressure, and apyretic. On neurological examination, she didn't present sensorimotor deficits and the tendon reflexes were normal. Visual pathway examination revealed bilateral homolateral amputation of the left visual hemifield. Funduscopic examination and photomotor reflexes were normal. Assessment of the other cranial nerves and cognitive functions was unremarkable.

Clinically, we retained LHH in our patient and a brain MRI was performed. This latter showed diffuse meningeal thickening predominating in the right occipital region (Fig. 1) associated with edema of the adjacent occipital lobe. Those radiologic features were compatible with right occipital lobe compression secondary to pachymeningitis.

At this stage, infectious, granulomatous, autoimmune, and neoplastic etiologies were evoked to be the most likely causes of these MRI abnormalities. Given the absence of fever and meningeal syndrome in our patient, an infectious cause was

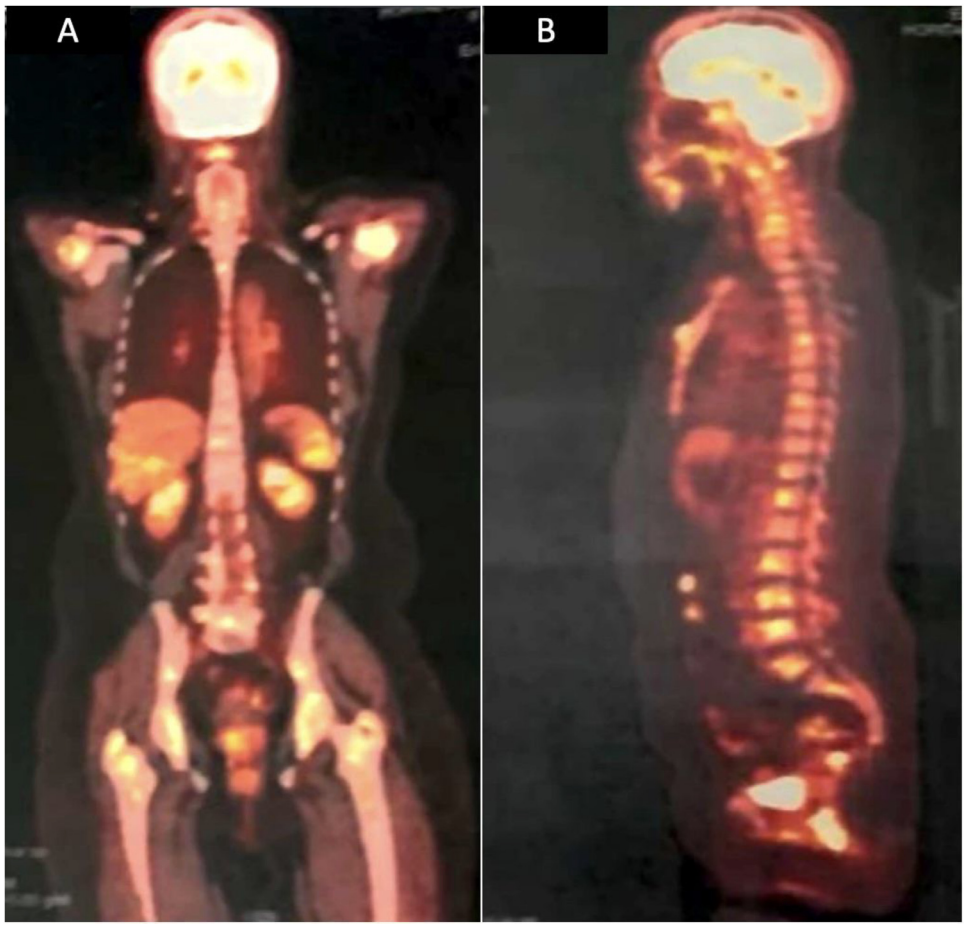

Fig. 4 – FDG PET scan of the whole body in coronal (A) and sagittal (B) views, demonstrating multiple pathological hypermetabolic breast nodules involving both mammary glands associated with multiple pathological hypermetabolic lymph node foci in multiple regions (supra-diaphragmatic, bilateral cervical, right supraclavicular, para-aortic, left pulmonary hilar and inter-pectoral, bilateral axillary and subdiaphragmatic areas) with secondary localizations involving the axial and peripheral skeleton.

less probable. This was supported by a normal complete blood count, normal C-reactive protein, normal cerebrospinal fluid (CSF) study, and negative HIV and syphilis serologies.

For etiologies such as granulomatosis, and autoimmune disease we did a dosage of angiotensin-converting enzyme that was normal, autoantibody assessment including antinuclear antibodies, anti-DNA, and anti-extractable nuclear antigen antibodies (SSA, SSB, Jo-1, Scl-70, anti-Sm, anti-RNP) that returned to be negative. The salivary gland biopsy study showed no evidence of vasculitis or granulomatosis. We completed the investigations with a thoracic-abdominal-pelvic (TAP) CT scan to look for signs of mediastinal sarcoidosis or systemic disease. We were surprised by the presence of multiple suspicious nodular lesions of the left breast with mamelon retraction and skin thickening associated with bilateral laterocervical and axillary adenopathies (Fig. 2). In addition, we noticed diffuse lytic and condensing lesions of the sternum, scapula, axial skeleton, and pelvis.

As these breast lesions were strongly suspected of being malignant, the patient was referred to the gynecology department, where a left mastectomy and axillary curage were performed. Histopathological examination was consistent with nonspecific infiltrating breast carcinoma (Fig. 3), with a grade II according to the Nottingham Grading System. The molecular pattern was indicative of a luminal subtype, with estrogen and progesterone receptors expressed by the tumor cells at 95% and 5% respectively, and negative human epidermal growth factor receptor 2 (HER2) status. The Ki65 proliferation index was evaluated at 5%. Additionally, there was no associated in situ component and no peritumoral vascular emboli.

The extension workup by an FDG-PET scan showed the presence of multiple pathological hypermetabolic mammary nodules involving the 2 mammary glands associated with multiple pathological hypermetabolic lymph nodes with secondary localizations involving the axial and peripheral skeleton (Fig. 4). Concerning the CSF study; the cell count, glucose, and protein levels were normal. We performed a search for neoplastic cells in the CSF, which was negative.

A review of the brain MRI showed bone lesions in the skull consistent with bone metastases that had been missed on the initial reading (Fig. 5). We also noted a continuum between the bone lesion and the frontal dural lesion. Based on these

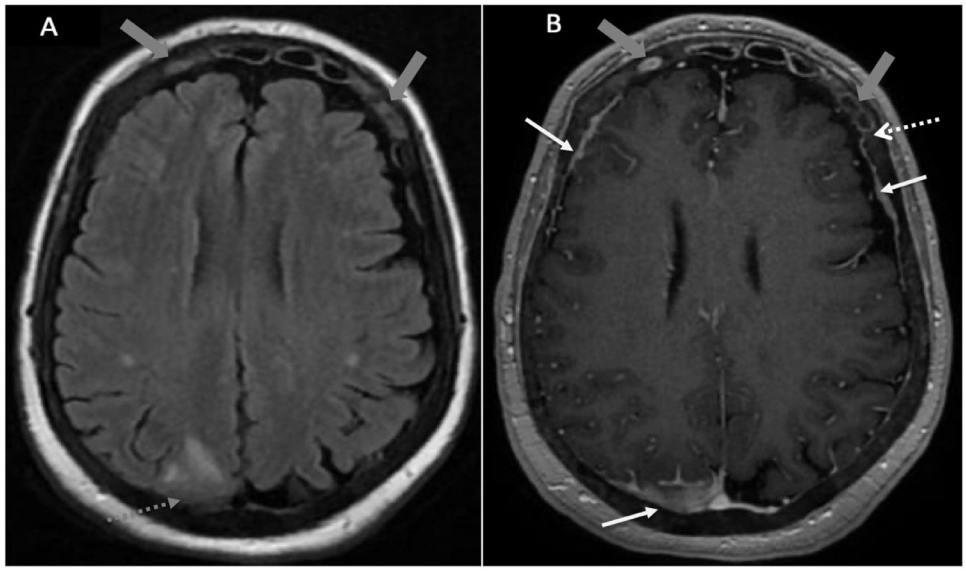

Fig. 5 – Axial brain MRI at an upper level (A: FLAIR sequence, B: post-Gado T1-weighted sequence) demonstrating diffuse meningeal thickening (white arrows) predominating posteriorly on the right side and shows FLAIR isosignal (dashed grey arrow) and enhancement on post-Gado T1 image (white arrows). There are also FLAIR hyperintense bone lesions (grey arrows) with contrast enhancement consistent with cranial bone metastases (grey arrows). Furthermore, the connection between the dural thickening and the bone lesion is shown in the post-Gado T1-weighted image (B; dashed white arrow). In addition, posterior parenchymal hypersignal on the right side and nonspecific hypersignal punctate FLAIR lesions without enhancement on post-Gado T1-weighted image.

data, the diagnosis of isolated metastatic pachymeningitis secondary to breast cancer, associated with diffuse metastatic adenopathies and bone metastasis, was retained. The patient was then referred to the oncology department, where chemotherapy treatment with tamoxifen and paclitaxel was initiated. The patient remained relatively stable for 16 months, with a good clinical tolerance to chemotherapy. Subsequently, her condition deteriorated and she died 18 months after the diagnosis.

Discussion

Isolated involvement of the dura mater by metastases originating from BC is a pathological entity characterized by histological evidence of primary BC associated with pachymeningeal metastasis, without parenchymal or leptomeningeal metastasis, on brain MRI. In addition, the definition of IPM includes the absence of malignant cells in the CSF after lumbar puncture, if performed [4]. Our patient fulfills completely these criteria as shown in the observation. Experts report that biopsying dural lesions is not necessary to support IPM when there is evident metastatic cancer. The biopsy of dural lesion in our patient wasn't performed, because the setting indicated a metastatic origin secondary to the breast cancer.

IPM is typically associated with epidural and subdural infiltration. Experts report that dural involvement occurs either by epidural metastases or by hematogenous dissemination [4]. We distinguish 2 types of dural metastases from BC on brain MRI: nodular subtype with focal thickening and diffuse subtype [6]. Nodular forms are commonly seen in positive HER2 breast tumors, and hematogenous spread is the most likely pathway to be involved in dural lesions [7]. In contrast, diffuse forms are especially reported among patients with luminal BC. This last type of cancer is associated with metastases that show a predilection for bone, which commonly leads to cranial involvement and subsequent development of dural metastases [7]. These findings are supported by our report which demonstrating that luminal-type BC is associated with bone metastases, including skull metastases, and diffuse dural thickening form of IPM. Moreover, the continuity that has been demonstrated between the frontal bone metastasis and the dura mater in our case has already been described in the literature [4]. The median age of patients with IPM secondary to BC is 53 years (ranging from 27 to 70 years), which is very close to the age of our patient [4]. Brain MRI in our study showed an IPM with diffuse multifocal distribution with a marked thickening in contact with the right occipital lobe, which is compressed. This compression caused the visual presentation of our patient. The most common clinical manifestations in patients with IPM are headache, and cranial nerve damage, followed by visual disturbances, altered mental status, and ataxia [4,6].

Any type of lesion in the retrochiasmatic pathway may provoke an HH. Generally, Lesions are mainly located in the occipital lobe and optic radiations [5]. The most common causes of HH in adults are stroke, trauma, tumors, brain surgery, and demyelinating lesions [5]. The detection of BC due to cranial metastases causing visual disturbances is rarely reported in the literature. To our knowledge, there are no similar cases of HH following dural lesions compressing the occipital lobe in

literature as reported in this case. The description of HH associated with BC is limited to a few cases where metastases were located within the retrochiasmatic pathway or occipital lobe in patients who are being followed for BC [8].

Diagnoses like neurotuberculosis, neurosarcoidosis, meningioma, and hypertrophic pachymeningitis can cause radiological lesions of dural thickening as seen in IPM, and the diagnosis may be challenging if the primary tumor is not found. Therefore, a rigorous clinical and paraclinical approach including imaging, CSF analysis and, if necessary, biopsy studies is required for accurate diagnosis. In our patient, we did a TAP CT scan to look for radiologic signs of systemic disease or sarcoidosis, and we found suspicious nodular lesions in the left breast. According to a study conducted by Desperito et al. [9], chest CT scan has a sensitivity of 84.21% and a specificity of 99.3% for the detection of BC . The incidence of BC detected incidentally following chest CT is increasing. Findings on chest CT scans that suggest malignancy include breast lesions with irregular margins (lobulated or spiculated), high enhancement, distortion of the fibroglandular architecture, and thickening of the skin around the lesion [9]. These radiological features were present in our patient's breast lesions.

Most patients with dural and multi-visceral involvement due to BC have poor survival outcomes. The management of these patients relies on surgical interventions when there are indications for it, radiotherapy, chemotherapy, and also palliative care [4]. The best way to treat IPM in BC patients has not yet been established. Chemotherapy is associated with the best median overall survival (OS) compared to radiotherapy and supportive care. Patients who received chemotherapy had an OS of 8.9 (95% 0.0-18.4) months [4]. Our patient initially responded well to treatment with a survival of 18 months after diagnosis, which is consistent with the literature.

Conclusion

Breast cancer is a common cancer that continues to cause significant morbidity and mortality in women worldwide. Detection of breast cancer following metastasis within the central nervous system is not uncommon. However, cases of IPM secondary to breast cancer are very rare and diagnosis can be extremely difficult if the primary tumor is not identified. In summary, our observation is very interesting because it highlights the involvement of luminal breast cancers in IPM, and also the need for a careful clinical and paraclinical approach to investigate for causes leading to pachymeningitis. At the metastatic stage, the management of patients with breast cancer becomes challenging with a poor prognosis.

Patient consent

Written consent for the submission and publication of this case report including images was obtained.

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