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REVIEW ARTICLE

Brain metastases: Literature review

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Abstract Brain metastases frequently occur secondary to poorly controlled primary lung, breast, melanoma, colorectal and renal tumours. Because of this, correct diagnosis and early treatment of brain metastasis is difficult, which is why the condition should be treated and controlled by a multidisciplinary medical team so as to obtain real-life and reliable statistics and to lower the incidence of brain metastasis, improving the quality of life of patients and reducing mortality rates.

PALABRAS CLAVE
Metástasis cerebral;
Quimioterapia;
Resección quirúrgica;
Radioterapia

Enfermedad metastásica cerebral: revisión de la literatura

Resumen La enfermedad metastásica cerebral (EMC) es una patología, frecuente sobre todo en tumores primarios de pulmón, mama, melanoma, colorrectal y renal descontrolados. El diagnóstico oportuno y tratamiento temprano, es la falla sobre la EMC, debido a la misma causa. Por lo que debería ser manejado con un equipo médico multidisciplinario, para poder controlar, obtener estadísticas reales, y fidedignas, y así bajar la frecuencia de EMC, mejorando la calidad de vida de los pacientes, y reduciendo las estadísticas de mortalidad.

Introduction

The real incidence of metastatic brain tumours remains unknown,[1,2] although some countries such as the United States of America report 17,000 cases annually,[1] and some

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Table 1 Incidence of brain metastasis.

Primary tumour	% Metastasis (12)	% Metastasis (13)
Lungs	11,763/59,038 (19.9%)	156/938 (16.3%)
Breasts	2635/51,898 (5.1%)	42/802 (5.0%)
Kidneys	467/7205 (6.5%)	12/114 (9.8%)
Melanoma	566/8229 (6.9%)	12/150 (7.4%)
Colorectal	779/42,817 (1.8%)	10/720 (1.2%)

Refs. 10, 11.

authors consider brain metastases such as intracranial tumour to be more common.

Brain metastases occur in 15–40% of patients with systemic cancer, which represents approximately 12 patients per 100,000 inhabitants per year.[3–5]

It is usually diagnosed between the 5th and 7th decade of life. This concurs with statistics from the American Cancer Society, which reveal that the probability of developing invasive cancer is high between 60 and 79 years of age.[6]

Even after performing a thorough study to identify the primary tumour, it remains undetected in 15% of patients.[7]

Certain types of cancers are more prone to spread to the central nervous system.[8] The most common, in order of frequency, are lung cancer, breast cancer, melanoma, colorectal and renal cancer, and less frequently thyroid cancer, gastrointestinal cancer and prostate cancer. Haematological neoplasms constitute only 10% of brain metastases and primarily affect the leptomeninges[9–11] (see Table 1).

Clinical diagnosis

Most patients' initial manifestations are neurological, and therefore their first point of contact is commonly with a neurosurgeon or neurologist before they are referred to an oncologist.[12] It is considered that 15% of patients in whom the primary tumour has been identified at the time of diagnosis and 45% of these who moreover present neurological symptoms will be diagnosed with metastatic brain tumour.[13,31]

The most common symptoms include (see Table 2) headache, weakness, alterations of higher brain functions, focal neurological deficit and seizures, which are caused due to a local mass, cerebral oedema and increased intracranial pressure.[14]

Table 2 Clinical manifestations in patients with brain metastasis (Neurosurg. Focus/Volume 22/March, 2007).

Clinical presentation	Number of patients		
	Primary tumour not identified	Primary tumour identified	Total
Focal deficit	78 (64)	108 (51)	186 (56)
Seizures	22 (18)	37 (17)	59 (18)
Intracranial hypertension	10 (8)	23 (11)	33 (10)
Headache	7 (6)	17 (8)	24 (7)
Asymptomatic	4 (3)	29 (14)	33 (10)

Values in brackets represent percentage of symptoms.

Diagnostic imaging

Nuclear magnetic resonance imaging (MRI) of the brain is considered to be the exam of choice in patients with clinical suspicion of brain metastasis because it has a high sensitivity and specificity.[15]

Nevertheless, in patients with a contraindication for MRI, computed axial tomography (CAT) scan of the brain or PET (positron emission tomography) are the favoured options. CAT scan of the brain can be performed with or without a contrast medium to reveal metastatic lesions that are isodense to the brain parenchyma (Fig. 1), whilst a hyperdense image suggests the presence of haemorrhage, which could lead to the diagnosis of lung tumour, renal tumour, thyroid tumour, choriocarcinoma or melanoma metastasis. Moreover, it determines whether the patient has hydrocephalus, brain oedema or brain herniation. When a contrast medium is administered the lesion is enhanced and multiple lesions become visible.[16,17,26]

MRI of the brain employs basic T1- and T2-weighted sequences, FLAIR, diffusion and perfusion, in addition to spectroscopy and tractography. Most metastatic lesions are hypointense on T1-weighted images, which could be indicative of haemorrhage, melanin and necrosis (Fig. 2). On T2-weighted images most lesions are hyperintense. Bleeding appears as hypointense when in acute state, and hyperintense when subacute, while vasogenic oedema is hyperintense.[18] Spectroscopy is a magnetic resonance

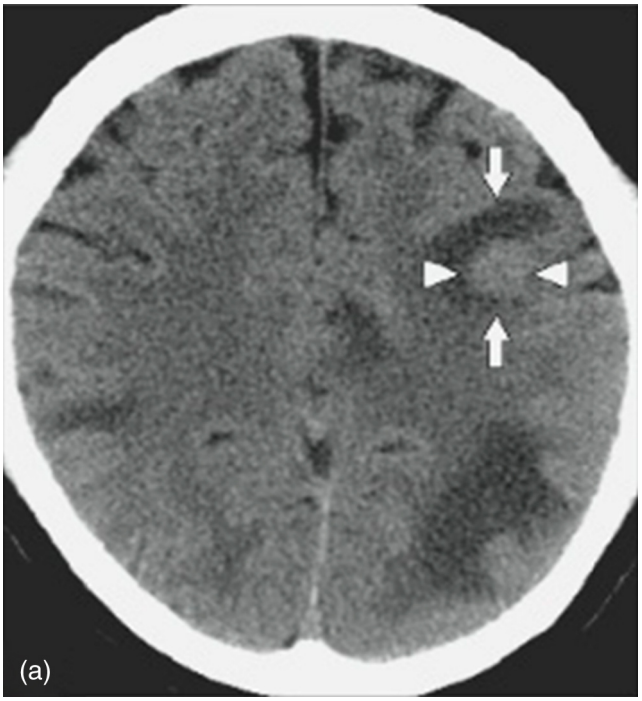

Figure 1 Axial cut of non-contrast CT brain scan showing an isodense image to the left frontal brain parenchyma marked with an arrow, as well as perilesional oedema corresponding to the hypodense image.