

C. De Grandi • A. Aliprandi • S. Iurlaro

Neuroradiological investigations in secondary headaches

Abstract In this work, we examine the neuroradiologic features of the main non vascular clinical conditions responsible for secondary headache; excluding CSF hypotension, which will be treated extensively in another work in this supplement. Headache is not a constant feature of intracranial mass lesions, even of large extension. Headache has a high diagnostic value in children, as it can be the only heralding symptom, sometimes even for a long time, of severe intracranial pathologies, which later give rise to seizure or focal neurological signs. Particular attention should be paid to children affected by leukaemia under pharmacological treatment, in which headache is almost always the presenting symptom of serious neurological syndromes, consequent to antineoplastic drugs.

Key words Neuroradiology • Secondary headaches

Headache in intracranial tumours

Headache is not a constant clinical feature of intracranial masses, as it develops only if pain-sensitive structures, like the meningeal sheaths, are stimulated or when intracranial pressure rises [1–4]. These events are much more likely in the following instances:

- *Intracranial mass of large extension.* This intuitive notion is generally valid, but we observed some cases of very large tumours or giant aneurysms which were never responsible for headache.
- *Obstruction of CSF outflow,* giving rise to hypertensive hydrocephalus. This event is more frequently related to tumours of the posterior brain; headache may be the only symptom of infratentorial tumours in children.
- *Obstruction of venous outflow.* When a tumour obstructs a venous sinus, thus slowing or even stopping blood outflow, the circulation into alternative venous routes increases. This event leads to dilatation of these venous structures and stimulation of meningeal pain-sensitive structures. Of course, these alternative routes may be insufficient for appropriate venous outflow, and brain swelling or venous infarcts may develop.
- *Primitive meningeal involvement.* Some highly metastatic tumours, such as lung or breast carcinoma or leukaemia, may cause a state of meningeal carcinomatosis and stimulate pain nerve fibres directly.
- *Lesions of the skull base* without involvement of brain parenchyma; this condition may lead to a delayed diagnosis, as it may not be evidenced by standard brain imaging techniques.

C. De Grandi (✉)
Neuroradiology Service
Università degli Studi Milano Bicocca, Ospedale San Gerardo
Via Donizetti 106, I-20052 Monza (MI), Italy
e-mail: pongol@tin.it

A. Aliprandi • S. Iurlaro
Department of Neurology
S. Gerardo Hospital, Monza, Italy

Idiopathic intracranial hypertension syndrome

The diagnosis is clinical as neuroradiologic studies may only exclude most other causes of headache. This benign syndrome is more frequently observed in obese women of young age and is often associated to the finding of an empty sella.

Headache in children

Headache should never be underestimated in children, as it may be the only symptom of a mass in the posterior cranial fossa.

A peculiar case is represented by children affected by leukaemia and under drug treatment [5–11]. In this instance the appearance of headache should prompt urgent neuroradiologic examination. According to the experience of our Department of Paediatric Haematology, which is the referral centre for haematologic disorders, headache may represent the presenting symptom of a serious neurological syndrome characterised by confusion, seizures and blindness.

There are two possible causes of this syndrome, both of which may be diagnosed with neuroimaging techniques: reversible posterior leukoencephalopathy and cerebral venous thrombosis.

Reversible posterior leukoencephalopathy. This syndrome has no specific clinical features and can clearly be demonstrated with NMR imaging of the brain. It is linked to brain damage induced by antineoplastic drugs (methotrexate, cyclosporine, steroids), especially in the induction phase of the therapy, and is reversible after treatment withdrawal.

Cerebral venous thrombosis. The clinical onset is often similar; the diagnosis can be made with CT or RMN scan of the brain.

Headache after head trauma

Severe head traumas are usually extensively investigated. Head traumas of milder severity, however, may be asymp-

tomatic in the acute phase and later develop neurological syndromes, which may present headache as the only symptom.

References

1. Dal Pozzo G (2001) *Compendio di Risonanza Magnetica. Cranio e Rachide*. UTET
2. Atlas SW (1996) *Magnetic resonance imaging of the brain and spine*. Lippincott-Raven
3. Scotti G (1993) *Manuale di neuroradiologia diagnostica e terapeutica*. Masson
4. Som PM (1996) *Head and neck imaging*. Mosby
5. Chen CY (1996) Childhood leukemia: central nervous system abnormalities during and after treatment. *AJNR Am J Neuroradiol* 17:295–310
6. Vazquez E (2002) Neuroimaging in pediatric leukaemia and lymphoma: differential diagnosis. *Radiographics* 22:1411–1428
7. Shin RK (2001) Reversible posterior leukoencephalopathy during treatment of acute lymphoblastic leukemia. *Neurology* 56:388–391
8. Kieslich M (2003) Cerebrovascular complications of L-asparaginase in the therapy of acute lymphoblastic leukemia. *J Pediatr Hematol Oncol* 25:484–487
9. Hinchey J (1996) A reversible posterior leukoencephalopathy syndrome. *N Engl J Med* 22:494–500
10. Casey SO (2000) Posterior reversible encephalopathy syndrome: utility of FLAIR MR imaging in the detection of cortical and subcortical lesions. *AJNR Am J Neuroradiol* 21:1199–1206
11. Chu WCW (2003) Imaging findings of paediatric oncology patients presenting with acute neurological symptoms. *Clin Radiol* 58:589–603