

Brain tumours in paediatrics: when should they be suspected?

Didu S Kariyawasam,¹ Tony McShane²

The paper by Chu *et al*¹ presents retrospective case note review data on a large number of patients with brain tumours. The authors used a large-scale number crunching exercise to show brain tumour diagnosis can be delayed and that these children often present with non-specific symptoms making diagnosis more difficult. The data for this study is relatively old as cohorts examined were between 1989 and 1997 to 2006. The patients had symptoms up to 2 years before diagnosis and presented to primary and secondary care with increasing frequency until the diagnosis was reached. What is to be done? The tabloid press regularly complains that UK doctors are slow to see patients and slow to do diagnostic tests. In the UK the general practitioner (GP) has traditionally been a gatekeeper, trying to prevent the unnecessary overinvestigation of patients. Most GPs and paediatricians recognise that resources are limited but are themselves usually very concerned when a diagnosis is missed. Subtle symptoms in preschool children are particularly difficult. Headache is a very common symptom at all ages, with up to 20% of children complaining of this symptom at some time.² Trying to decide who should be referred for a scan can be a challenge.

History and examination remains the cornerstone of diagnosis in medicine including paediatrics, but with non-specific symptoms and limited signs, or

examination proving difficult, a brain tumour may not be suspected. Delays in diagnosing a brain tumour have long been recognised with a fifth of patients initially misdiagnosed with primary headache.^{3 4} Diagnostic delay may in turn have a deleterious effect on the acute management and the ultimate prognosis for the child.³

This paper noted that in children 0–4 years old, the predominant symptoms at diagnosis were visual disturbance including disturbance of cranial nerves II, III, IV and VI. In this cohort, non-localising symptoms of raised intracranial pressure (ICP) such as nausea, vomiting, papilloedema and increasing head circumference were also more commonly noted alongside behavioural/cognitive changes and non-specific presentations such as irritability, drowsiness, failure to thrive and delayed milestones. Focal neurological deficits, convulsions, growth and endocrine problems and headache were less common. Beyond this age, presentation with headache was by far the most common symptom, with increasing presentation rate with age. Visual disturbance was also a common symptom, which again increased in presentation rate with age. Convulsions were most common in young adults.

All symptoms increased in presentation rate over time to diagnosis. A history of persistence and an increase in frequency and severity of initial symptoms can therefore point to intracranial pathology.

Persistent headache is a common symptom in clinical practice. Most of us will have patients with chronic daily headache resistant to all treatment interventions. These patients rarely have a tumour but when arising as a new and escalating symptom in a previously well child, brain tumour does

need to be excluded particularly if there are other symptoms such as behavioural or cognitive changes. Symptoms more specific of raised ICP only become prominent in the month prior to diagnosis, with alterations in general mood and cognition also occurring more commonly from 3 months to 6 months prior to diagnosis. Focal neurological deficits may not be obvious even at time points close to eventual diagnosis.

Efforts have been made to try and improve diagnostic accuracy. The study by Berlaer *et al*,³ looked at 117 children under 16 years presenting to the emergency department with headache. None of 33 children imaged due to concomitant 'red flag' symptoms had an intracranial tumour. This would suggest that imaging for all children presenting with headache would be costly and give a low diagnostic yield.

The predictive power of this and other individual symptoms may be improved by a history of other red flag symptoms such as diurnal variation of headache, other raised ICP symptoms, squints, faltering growth, behavioural and developmental regression as well as clinical signs, such as increasing head circumference.⁶

The size of the problem is well described by Wilne *et al*⁷ with 10 new tumours diagnosed in the UK every week. New (2015) National Institute of Health and Care Excellence (NICE) guidelines recommend 'very urgent' referral (within 48 h) for suspected brain tumour in children with newly abnormal cerebellar function or other central neurological function.⁸ The guidelines recognise that delineating very specific symptoms and signs would be too narrow and would potentially miss cases amenable to early management.

Chu *et al*, and others have shown that localising signs occur late in the disease process and early non-specific symptoms may not trigger early suspicion of brain tumour. Waiting for specific localising signs or symptoms of raised ICP will delay time to diagnosis. Children with brain tumours will present with increasing number and persistence of symptoms. This pattern over time

¹Department of Paediatric Neurology, Children's Hospital Oxford, Oxford, UK; ²Children's Hospital Oxford, John Radcliffe Hospital, Oxford, UK

Correspondence to Dr Tony McShane, Children's Hospital Oxford, John Radcliffe Hospital, Oxford OX3 9DU, UK; tony.mcshane@btinternet.com

should increase clinical suspicion with referral for scanning in a timelier manner. Visual disturbance particularly in the preschool child is found to be a suggestive presenting feature of brain tumour that must be fully investigated. Review by a local optician can often prove very valuable. Opticians will be skilled at picking up subtle eye signs. The 'Headsmart' brain tumour awareness leaflet lists the important symptoms in each age group.⁹ All doctors in primary and secondary care need to be alert to the possibility of brain tumour in any child with neurological symptoms and consider brain imaging if 'red flag' symptoms occur, or symptoms persist or escalate particularly if associated with subtle changes in behaviour or learning.

If we are to deliver earlier diagnosis then investment in personnel and imaging resources will be essential. Increasingly, imaging will need to be with MRI in all but emergency situations, in view of the potential risk of causing cancer with CT, which is known to triple the risk of leukaemia and brain tumours when cumulative radiation doses of 50 mGy and 60 mGy are used, respectively.¹⁰ MRI is the modality of choice when considering posterior fossa pathology. Thus, easier access to sedation or anaesthetic MRI for young children will need to increase concomitantly.

The paper by Chu *et al* is helpful and delineates the more common symptoms

occurring in each age group, and underlines the importance of rethinking and reinvestigating persisting and escalating symptoms, especially when associated with cognitive and behavioural decline. The paper allows us to conclude that raised ICP symptoms occur late in presentation and their absence should not prevent clinicians from investigating symptoms further. However, the paper findings have to be taken within context of what is considered reasonable management of symptoms that are common across paediatrics. Elucidating red flag signs and symptoms as well as close review of the child's progress over time should therefore inform the need for neuroimaging and further management.

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