Diagnosis of brain tumours in children is improving, but the UK still lags behind other western countries. Knowledge of symptoms will allow nurses to improve early diagnosis.

How to identify signs of brain tumours in children

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In this article...

› Incidence of brain tumour in children
› Common and non-specific symptoms
› Questions to ask when assessing children

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Brain tumours are the leading cause of cancer-related deaths in children. Prompt recognition of symptoms facilitates an early diagnosis, which is likely to result in a better outcome. The initial symptoms may mimic those of less serious illnesses, and brain tumours take longer to be diagnosed in the UK than in other western countries.

The HeadSmart campaign was set up in 2011 to increase awareness of brain tumours in children among health professionals and the public. Since its launch, the time to diagnosis has reduced. Practitioners in many clinical areas play an important role in early recognition and diagnosis of brain tumours. The HeadSmart symptom card is a valuable tool in assessing children.

Brain tumour is an abnormal and uncontrollable growth of cells in the brain. Every year an average of 412 new cases are diagnosed in children under 15 years of age in Great Britain. Brain tumours account for a quarter of all childhood cancers and are the leading cause of all cancer-related deaths in children in the UK (Cancer Research UK, 2014).

Studies have shown worse outcomes and increased mortality in children whose diagnosis is delayed (HeadSmart UK, 2014; Lethaby et al, 2013; Wilne et al, 2010). Wilne et al (2010) noted in two cohort studies that it took three times longer for children in the UK with brain tumours to be diagnosed than those in North America, Poland, Israel and Switzerland.

Reasons for delay in diagnosis
The initial presentation of brain tumours in children frequently mimics more common, less serious conditions. Children may have new-onset seizures, unsteadiness on their feet starting coincidentally after a viral illness, deterioration in school performance considered to be secondary to hearing or visual difficulties, or gradual loss of sensation in a limb (Wilne et al, 2013; 2010).

There is a need for better awareness among practitioners and HeadSmart was set up to achieve this (Paul and Walker, 2013). This multiprofessional and public

5 key points

1 Brain tumours are the leading cause of childhood deaths related to cancer
2 Every year, an average of 412 new cases are diagnosed in children aged under 15 years
3 The average time to diagnosis of brain tumours in children is 6.9 weeks
4 Headache and vomiting are the commonest symptoms of brain tumour in older children
5 Survival is improving, with about 65% of children with a brain tumour surviving for more than five years after diagnosis

BOX 1. RISK FACTORS

● Family history of associated genetic conditions such as neurofibromatosis or tuberous sclerosis
● Exposure to ionising radiation such as treatment for previous malignancies or dental X-rays
● Parental occupation in industries such as aircraft, agriculture, petroleum, painting, printing, electrical and chemical solvents (small increased risk)
● Male sex – higher risk for invasive brain tumours
● Personal or family history of a brain tumour, leukaemia, sarcoma or early onset breast cancer

Adapted from Paul et al (2014); Paul and Walker (2013); Wilne et al (2015; 2010)
awareness campaign uses quality improvement techniques to bring about change (Wilne et al, 2013). Resources on the HeadSmart website (www.headsmart.org.uk) include a training module.

Between Headsmart’s launch in 2011 and June 2013, the average time to diagnosis of brain tumours in children in the UK fell from 9.3 to 6.9 weeks; it aims to reduce this time to five weeks, in line with other western countries (HeadSmart UK, 2014; Paul and Walker, 2013).

HeadSmart has identified that delays in the diagnosis can occur at different stages for a variety of reasons. At patient level, the “appraisal and health-seeking interval” occurs while the patient and family become aware of symptoms and decide whether to contact their GP.

At primary health system level, the “GP recognition of symptoms interval” is the time it takes for an assessment to be made leading to investigation or referral, and the processes associated with the initiation of investigation or referral.

The “secondary health system interval” is the time taken to make arrangements for assessment, for physician/surgical recognition of symptoms and for diagnostic investigations.

The “pre-treatment interval” is the time taken to start the first treatment after diagnosis. In brain tumours, this usually leads up to the date of primary surgery.

Clinical presentation

Health professionals working both in primary and acute care will see children who may have brain tumours, so it is vital they are able to identify and recognise the signs and symptoms early (Wilne et al, 2013).

As the initial presentation of a brain tumour can be misleading and may be attributed to a less serious illness, it is important to compare the symptoms with the HeadSmart symptom card (Fig 1), which aids in referral and investigation.

Other symptoms that should raise suspicion of brain tumours include reduced consciousness, diabetes insipidus (excessive drinking and urination), abnormal growth or delay in the onset of puberty, and dienecphalic syndrome in young children (emaciation despite normal energy intake) (Wilne et al, 2013; 2010). Particular care should be taken while dealing with children from high-risk groups (Box 1).

In a study of 204 children in the UK with a central nervous system tumour (Wilne et al, 2006), the commonest symptoms were:

- Headache (41%);
- Vomiting (12%);
- Unsteadiness (11%);
- Visual difficulties (10%);
- Educational or behavioural problems (10%);
- Seizures (9%).

Brain tumour symptoms in children, unlike those in adults, are not the same in all age groups. The HeadSmart card enables practitioners to identify symptoms early on at different stages. Up to 20% of preschool children will complain of a headache at some point although the incidence of brain tumours in preschool children is only 3.4 per 100,000 per year (McCrea and Howells, 2013). Wilne et al (2006) identified that in children aged under three years, behavioural problems were most prominent at initial presentation (48% of cases), while headache (12%) or seizures (7%) were less common.

Ataxia secondary to posterior fossa brain tumours (which account for almost 50% of childhood brain tumours) tends to be subacute (ataxic symptoms develop over days to weeks), and is often accompanied by symptoms of raised intracranial pressure including headache, vomiting, gait disturbances, blurred or double vision, behavioural change, sudden increase in head circumference and loss of consciousness (Prasad et al, 2013).

The case study (Box 2) highlights some of the difficulties in identifying the signs and symptoms of brain tumours early on. This case demonstrates how easily initial brain tumour symptoms can be missed in a young child, and may be attributed to a less serious pathology due to their non-specific nature. The diagnosis may have been further delayed in this case had the girl not had a coincidental head injury. The use of the HeadSmart symptom card may have led to early suspicion about her condition.

**Box 2. CASE STUDY**

A girl aged three-and-a-half years presented after having fallen from a slide in the playground with possible loss of consciousness for 30 seconds, followed by what parents described as being “wobbly” on her feet. Initial observations were stable including a normal Glasgow Coma Scale score of 15/15. She was admitted for overnight neurological observations which remained stable. However, as she remained slightly unsteady, a CT scan of the brain was organised and this revealed a space-occupying lesion in the brain. Diagnosis of brain tumour was made and transfer to the specialist neurosurgical unit arranged urgently. Further discussion with the family before transfer revealed that the girl had been occasionally wobbly on her feet over the past three weeks, since she had had a viral illness. Her parents also reported that her behaviour had changed significantly over the past few weeks and she had recently been labelled as being naughty at preschool.

Her general practitioner and health visitor had been consulted on a couple of occasions in the preceding two weeks but the family were reassured that this was due to her recent viral illness and she would get over it soon.

She underwent neurosurgical treatment and remains under the care of the paediatric oncology team and is making good progress.
Diagnosis and management

The most important step is to take a detailed and focused history of symptoms. It is important that while assessing a child presenting with symptoms suggestive of a brain tumour, nurses enquire about age-specific symptoms (Fig 1) (Paul et al, 2014; 2013). Any suspicion about a brain tumour should be immediately discussed with a medical professional, preferably a local paediatrician. Some useful tips to avoid common pitfalls are given in Table 1.

Primary care practitioners play a key role in early identification and referral to specialist services. The HeadSmart symptom card can be used as a justification for referring a child to secondary care services for neuroimaging when two or more relevant symptoms are present. It can also be used to reassure the family if the child does not have any symptoms relevant to brain tumours and it may be better to adopt a wait-and-watch approach.

The child presenting to the emergency department with signs of raised intracranial pressure such as vomiting, headache, visual difficulties and altered consciousness should be triaged in the urgent category and stabilised before neuroimaging studies (Paul et al, 2014; SIGN, 2009). In such situations, a computed tomography scan is generally done. However, if the child is stable and it is safe to wait, a magnetic resonance imaging scan is a better option as it gives more detailed information about brain tumours (Paul and Walker, 2013). Health professionals play an important role in keeping the child stable, performing neurological observations and other supportive measures while coordinating a safe and swift transfer to the neurological unit (Paul et al, 2014). Depending on its location, nature and size, the tumour may be surgically removed straight away or may require chemotherapy or radiotherapy to shrink it before surgical resection (Paul and Walker, 2013; Prasad et al, 2013; Wilne et al 2013).

Children are usually cared for in a paediatric oncology centre by a multi-specialty team of neurosurgeons, paediatric oncologists, paediatricians and, hospital and community oncology nurses. During the treatment phase, for example during chemotherapy, children may be admitted to their local hospital. They may have episodes of fever or suspected infection, including neutropenic sepsis requiring treatment with intravenous antibiotics. Primary care nurses play an important role in identifying neutropenic sepsis and deterioration after successful treatment, and in supporting children and their families in the community.

### Table 1: Brain Tumour Symptoms in Children

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headaches</td>
<td>Headaches due to brain tumours can occur any time of the day</td>
</tr>
<tr>
<td>Nausea and vomiting</td>
<td>A central nervous system cause (such as brain tumour) may be behind persistent nausea or vomiting lasting more than two weeks</td>
</tr>
<tr>
<td>Visual difficulties</td>
<td>Vision should be assessed: this may be difficult in very young and uncooperative children and may need an ophthalmology referral</td>
</tr>
<tr>
<td>Gait disturbances</td>
<td>Persistent gait disturbance lasting more than two weeks</td>
</tr>
<tr>
<td>Behaviour disturbances</td>
<td>Ask about behaviour change or deterioration in school performance</td>
</tr>
<tr>
<td>Growth and development</td>
<td>Fatiguing of growth and associated nausea and vomiting</td>
</tr>
<tr>
<td></td>
<td>A child who has polyuria and polydipsia but normal blood glucose may have diabetes insipidus, a presenting feature of brain tumours</td>
</tr>
</tbody>
</table>

Based on Wilne et al (2010)

Prognosis

Survival is gradually improving, with about 65% of children with brain tumours surviving for more than five years after diagnosis (Cancer Research UK, 2013). However, about 60% of survivors have moderate to severe disabilities (Wilne et al, 2010).

The greater the delay in diagnosis, the greater the likelihood of irreversible neurological deficits, such as loss of sight, endocrinopathies, cognitive deficits and learning difficulties (Wilne et al, 2010). Children who get rapidly diagnosed tend to have fewer long-term complications (Paul and Walker, 2013; Wilne et al, 2010).

While improvements in treatment have improved survival, complications include intellectual decline, growth hormone deficiency, permanent neurological disabilities, reduced bone density and increased risk of fracture, and increased risk of developing other cancers in the ensuing decades (Wilne et al, 2010).

Conclusion

Brain tumours are the leading cause of cancer-related deaths in children. Children presenting with signs of raised intracranial pressure tend to be diagnosed earlier than those presenting with non-specific symptoms. The HeadSmart symptom card highlights specific symptoms linked to brain tumours in different age groups. NT

References


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