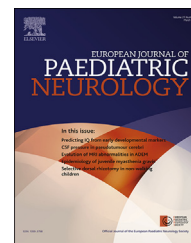




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Original article

Evaluation of a follow-up program for mild traumatic brain injury in schoolchildren



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ABSTRACT

Introduction: Mild traumatic brain injury is a common condition in childhood. Although classified as mild, post-concussive symptoms may persist and interfere with daily activities. Because no established guidelines exist with respect to follow-up medical care for these children, there may be a delay in receiving appropriate care. We developed a follow up program to screen for persistent symptoms and if necessary, refer patients for further medical assistance.

Methods: From July 2010 until December 2013, eligible children aged 4–18 years who presented after sustaining a mild traumatic brain injury were included. All patients received a phone call after 6 weeks. After a period of 3 months, both their schoolteacher and parents were asked to complete in a questionnaire. The results were discussed monthly by a multidisciplinary team.

Results: A total of 305 children were enrolled in our follow-up program. Headache was the most common acute symptom upon presentation (63%). Overall, 19% of all patients had problems, either at 6 weeks or 3 months. 14% of these patients were referred for special care. Most common persistent post-concussive symptoms were headache (32%), cognitive problems (23%) and behavioural problems (16%). After a period of two years, a review of patient charts revealed that all of the problems were resolved.

Conclusion: One fifth of the children exhibit post-concussive symptoms after mild traumatic brain injury. Education of patients and caregivers and a follow up visit if needed applied appropriate care at an early stage to minimise physical and mental problems.

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1. Introduction

Mild traumatic brain injury is a relatively common condition in childhood. The incidence is difficult to estimate, studies report a prevalence of 6–8/1000 children over 4 years old.^{1,2} Some children do not experience any symptoms after head injury. Mild traumatic brain injury is described by the WHO as an acute brain injury resulting from mechanical energy to the head from external physical forces. Clinical identification includes a Glasgow Coma Scale (GCS) of a minimum of 13, a loss of consciousness for less than 30 min and a posttraumatic amnesia for a maximum of 24 h.² In cases of mild injury, patients often show few symptoms. However, some children experience ongoing complaints such as headache, cognitive problems and behavioural problems that may interfere with their daily activities and intellectual performance. These problems persist beyond the first week after the trauma in a percentage of these children.^{2–4} Wade et al. found that there were less post-traumatic symptoms when applying early supportive care such as early neuropsychological evaluation and referral to other specialists.⁵ Because children often present few signs and parents do not always attribute the symptoms to the brain injury, there can be a delay in receiving the appropriate care. As a result, such children are at risk for long-term negative effects since these deficits potentially interfere with their development. The acute management of mild traumatic brain injury is well documented. For example, the guidelines of the Dutch Association for Neurology (Nederlandse Vereniging Neurologie) emphasise the use of imaging and hospitalisation.⁶ However, there are currently no guidelines in the Netherlands for the follow-up of mild traumatic brain injury and related post-concussive symptoms. Furthermore, we know of no international guidelines for the early detection and treatment of these post-concussive problems in children. Studies have shown that early interventions such as patient information folders and follow-up decrease the negative effects on the child's development.^{5,7}

In this paper we evaluate the results of a follow-up program in our hospital for children aged 4–18 with mild traumatic brain injury. This program was developed for this specific group because of the possible problems that may manifest particular in school aged children. Apart from difficulties reported by parents, observations from school teachers could also be taken into account during the evaluation of problems. Our main goal was to screen for post-concussive symptoms and, if needed, refer children for care. As a corollary, we wanted to evaluate if our method was suited as a follow-up program.

2. Methods

Our study took place at the Zuyderland medical centre, a general hospital in Heerlen, the Netherlands. Children between 4 and 18 years of age who were presented with mild traumatic brain injury according to the WHO classification were evaluated, either in the emergency department or the neurologic or paediatric outpatient clinic. Depending on their clinical status they were either hospitalised or discharged immediately in accordance with the pertinent Dutch guideline.⁶ The same

guidelines were used for deciding whether or not to obtain cerebral imaging. Upon discharge, these patients were given patient information describing mild traumatic brain injury, possible long-term effects and our follow-up program.

Patients were included in the follow-up program through consulting the hospital registration system and daily reports from the paediatric and neurology department. Children were excluded from analysis if they had a significant medical condition such as pre-existent psychomotor retardation, neurological and psychiatric problems or severe behavioural problems. Nonetheless, each of these cases was discussed by the multidisciplinary team to evaluate whether follow-up was useful/indicated. The program started in July 2010, and we evaluated our results in January 2014.

Six weeks after the trauma occurred, parents received a phone call from our research nurse to determine if any problems were evident. Results of these phone calls were reported to a multidisciplinary team. If necessary, a visit to the paediatrician, neurologist, psychologist or paediatric rehabilitation physician was planned. Three months after the trauma the patients' parents and primary school teacher or high school mentor received the "Screening tool for Cognitive, Emotional and Social consequences of brain injury in children" (SCES), a questionnaire used as an identification tool for problems in the aforementioned areas.⁸ A psychologist evaluated all questionnaires. Results of the follow-up by phone and the questionnaires were discussed in monthly meetings of a multi-disciplinary team consisting of a paediatrician, paediatric rehabilitation physician, psychologist, paediatric neurologist and a research nurse. During these meetings, every patient with reported problems related to the traumatic brain injury was discussed to determine if these patients required further medical assistance. Children were referred to a specialist according to the nature of their problem.

The children with headaches were primarily referred to the neurologist or, if already involved in their care to a paediatrician. If indicated, a graded exposure program was initiated. Children with cognitive or sleeping disorders and behavioural problems were referred to the psychologist. Children with behavioural problems interfering with school or daily activities were also seen by the paediatric rehabilitation physician. The paediatrician was involved when there were physical problems, which were possibly not caused by the trauma. After two years, all charts of patients who reported problems were reviewed to assess the course of their problems and treatment. The patients' data have been collected in a database using Microsoft Excel 2010.

3. Results

A total of 305 children were enrolled in our follow-up program, of which 179 (59%) were boys. The median age for girls was 10 years (4–15 years), the median age for boys was 11 years (4–18 years).

3.1. Trauma mechanisms/causes of injury

The causes for the head trauma in the group were divided into different categories. Forty-seven percent of the mechanisms

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