

Original article

The long-term health impact and potential predictors of cardiopulmonary arrest in patients with childhood-onset psychomotor impairments

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Abstract

Aim: The aim of the study was to understand the long-term health issues and potential predictors of cardiopulmonary arrest (CPA) in patients with severe childhood-onset psychomotor impairments.

Method: In this single-center, retrospective observational study, the medical records of 140 patients with severe childhood-onset psychomotor impairments were reviewed. The medical interventions and functional status of patients with a history of CPA ($n = 22$: 14 M/8F; mean \pm SD age: 26.6 ± 12.4 years) were compared with age- and sex-matched patients without a history of CPA ($n = 44$: 28 M/16F; mean \pm SD age: 26.5 ± 12.3 years).

Results: The prevalence of CPA was 15.7%. The most frequent cause was respiratory issues, and CPA occurred most frequently between 0 and 5 years old. The patients who had a history of CPA were more likely to have required a feeding tube ($p = 0.0007$), tracheostomy ($p < 0.0001$), and ventilator ($p = 0.002$) compared to the non-CPA patients, while the prevalence of tracheostomy or ventilator treatment during early infancy was comparable between both groups. Although statistically non-significant, patients who used antiepileptics or feeding tubes during the neonatal period had higher odds of a future CPA.

Interpretation: This single-center study indicated that the prevalence of CPA could be high among individuals with severe childhood-onset psychomotor impairments, and patients who experience CPA have more health issues. The potential predictors for a future CPA are young age (0–5 years), respiratory issues, and antiepileptic or feeding tube usage during the neonatal period. These patients may require extra attention in medical managements.

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Keywords: CPA; Childhood-onset; Psychomotor impairments; Respiratory issues; Medical intervention; Antiepileptics

1. Introduction

Several heterogeneous disorders can cause severe psychomotor impairments and comorbidities in children. Medical provisions for children with severe psychomotor impairments comprise an important component of

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pediatric services. New treatments for these diseases have been vigorously pursued, and some have been successful in improving survival. However, there remain affected individuals who have significant neurological impairments [1–3].

Life expectancy in those with childhood-onset psychomotor impairments has been well documented in previous studies; more severe disability is associated with poorer survival [4,5]. However, it also has been reported that some individuals, even those with severe impairments, may survive well into adulthood [6,7]. Among the previous studies that have examined life expectancy in patients with cerebral palsy, the majority have concluded that survival has not improved over time [6,7]. However, some authors have indicated that there is a demonstrable increase in life expectancy [8,9].

Patients with childhood-onset psychomotor impairments may suffer from various comorbidities, such as gastrointestinal and nutritional problems, seizures, respiratory failures, and orthopedic problems [1,10,11], depending on the underlying disease and the severity of the disability. The impairment is often lifelong, requiring significant medical input throughout life [1]. Given the expectation of long-term survival in children with psychomotor impairments, consideration of their quality of life (QoL) is essential. Studies have shown that the health-related QoL of individuals with cerebral palsy is lower than that of the general population [7,12,13]. However, in patients who are able to self-report, subjective well-being was comparable to that of the general population, and the average differences in QoL between the least able and the most able patients with cerebral palsy were generally less than 0.5 SD [14]. These findings suggest that even those with a severe disability can expect a long life. Therefore, a high QoL is imperative not only for the patient but also for their families and society.

Due to their disabilities and comorbidities, patients with childhood-onset psychomotor impairments carry multiple factors that predispose themselves to life-threatening events such as cardiopulmonary arrests. It is well established that a significant proportion of those in the general population who survive cardiopulmonary arrest (CPA) experience a deterioration in their neurological function [15,16]. Despite the number of studies that have described the mortality of people with disabilities, the long-term consequences of people with disabilities who have survived CPA have not been addressed. In this study, we aimed to assess the long-term health consequences in CPA survivors with a pre-existing childhood-onset psychomotor impairments. We also sought for potential predictors of a future CPA.

2. Participants/methods

2.1. Participants

This retrospective observational study was carried out at the Department of Child Neurology, National Center Hospital, National Center of Neurology and Psychiatry in Tokyo, Japan. The department's services include treatment and investigation of the neurological and muscular disease, and provisions of respite and residential long-term care for patients with childhood-onset severe psychomotor impairments. Patients with childhood-onset psychomotor impairments who had been admitted to the child neurology department for respite services or were the recipients of residential long-term care service from January to December of 2013 were considered eligible for the study. The reason for choosing these patients as participants was that they lived near or within the hospital and had been visiting or had been cared for by the hospital for a long time such that long-term detailed medical records were available.

2.2. Assessments

Lifelong medical records of the patients were reviewed. Demographic information, including age, sex, underlying neurological disorder, current motor and intellectual function, and medical interventions, were obtained from the medical record. Motor and intellectual function was classified as bedridden, can sit or walk (motor function), and can or cannot communicate (intellectual function). For medical intervention, the need for antiepileptics, a feeding tube, a tracheostomy, or a ventilator was assessed. Surviving patients with a history of CPA after the neonatal period were extracted from the cohort, and further medical information relating to the CPA episode was reviewed. A CPA was identified as such when there were descriptions of “cardiopulmonary arrest” or “cardiac arrest” in the medical record. The participants with CPA at birth were not considered here, but were considered as patients with cerebral palsy. The cause of CPA, age at the CPA episode, and age at epilepsy onset, initiation of tube feeding, tracheostomy surgery, and initiation of ventilation were assessed to characterize the group of patients with CPA.

The availability of medical intervention for physically disabled people has changed over time. For example, the use of the gastrostomy procedure has substantially increased in the past 20 years [8]. In addition, previous studies have suggested an effect of aging on functional decline in individuals with cerebral palsy [17]. Therefore, age- and sex-matched individuals with no history of CPA were chosen from the cohort as controls in one to two ratio. The patients with a history of CPA (CPA

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