

Neuropsychological and neurological sequelae of out-of-hospital cardiac arrest and the estimated need for neurorehabilitation: a prospective pilot study

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Abstract

Background: Diffuse brain injury is a key component of post-cardiac arrest syndrome reported in 30–80% of survivors of out-of-hospital cardiac arrest (OHCA). It is responsible for a high mortality rate, and is a common cause of cognitive and neurological deficits and disability. Symptom variability and dynamics and the rehabilitation potential remain poorly understood.

Aim: To investigate symptom prevalence, type, and severity and the natural course of recovery within 12 months after OHCA, and to estimate neurorehabilitation needs.

Methods: Study participants were selected from OHCA survivors admitted consecutively to a cardiac intensive care unit (CICU) serving 250,000 of Warsaw's inhabitants, according to the following inclusion criteria: first ever nontraumatic, normothermic cardiac arrest, age ≤ 75 years; cardiology ward survival until discharge, and no history of pre-existing brain disease. Patients' cognitive and neurological status and disability were evaluated in the first days after onset and three, six and 12 months later. Neuropsychological assessment focused on attention, memory, executive, linguistic and visuo-spatial abilities. Neurological examination included assessment of cranial nerves, muscle strength and tone, deep tendon reflexes, cerebellar function, sensory function, and gait. The general psychophysical state was classified using the Disability Rating Scale. Patients' neurorehabilitation needs were determined using data collected three months post-OHCA. This data was used to estimate future demands for such resources in Poland.

Results: During a 28-month study period, of 69 OHCA patients admitted to the CICU, 29 met the study criteria (33 survived until discharge from cardiology unit; four did not meet further criteria). Severe consciousness disorders were most frequent in the early post-OHCA phase (28%); no unresponsive patients were identified 12 months later. Of responsive patients who were capable of at least minimal co-operation, 100% (early after OHCA) to 57% (12 months after OHCA) had cognitive impairment, usually with neurological symptoms. Memory impairment was the most common and severe problem, followed by executive, attentional, language and visuo-spatial dysfunctions. The prevalence of neurological deficits ranged from 88% (early after OHCA) to 43% (12 months after OHCA). Due to acquired deficits, between 71% (early post-OHCA) and 36% (12 months post-OHCA) of patients were significantly disabled and often dependent. Although dysfunctions tended to improve, over 50% of the patients remained impaired 12 months post-OHCA, and over 30% were significantly disabled. We estimated that about 800 OHCA survivors/year in Poland will develop symptoms requiring neurorehabilitation.

Conclusions: Cognitive and neurological symptoms are common after cardiac arrest brain injury. Establishing specialised neurorehabilitation centres is essential for treating these patients.

Key words: brain symptoms, cardiac arrest, neurorehabilitation

Kardiol Pol 2014; 72, 9: 814–822

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Received: 18.12.2013

Accepted: 20.03.2014

Available as AOP: 01.04.2014

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INTRODUCTION

Out-of-hospital cardiac arrest (OHCA) is an important cause of death in developed countries, but advances in emergency healthcare have increased the percentage of cardiac arrest survivors. In Europe, the incidence of sudden cardiac arrest in 1980–2004 was estimated to be 38 per 100,000 person-years with a survival rate of 10.7% [1]. In Poland, the reported incidence rate of OHCA is 55.6/100,000 inhabitants/year [2].

After successful cardiopulmonary resuscitation, patients are at risk of post-cardiac arrest syndrome. This syndrome comprises a combination of pathophysiological processes such as post-cardiac arrest brain injury, post-cardiac arrest myocardial dysfunction and systemic ischaemia/reperfusion response, and is often complicated by the underlying pathological processes that caused OHCA. Widespread brain damage is a key component of the syndrome. Present in 30–80% of survivors [3–5], brain damage is responsible for high in-hospital mortality rates among patients admitted to intensive care units (~65%) and is a common cause of morbidity [3, 6]. Some clinical trials suggest that induced mild therapeutic hypothermia can ameliorate acute brain injury, increasing the likelihood of survival and improving functional neurologic outcome [7].

OHCA survivors show no fixed pattern of cognitive and neurological consequences of brain injury [8–10]. The symptoms depend on the degree of brain damage, which is proportional to the duration of OHCA [11–13]. The most common cognitive disorders range from minor disability to no conscious cognitive activity due to severe arousal disturbances, limited awareness and attention, and higher-level cognitive dysfunctions. The latter commonly include memory and executive disturbances [14] and personality abnormalities [9, 12]. Elementary neurological impairments may include parkinsonism, dystonia, chorea, tremor, tics, athetosis, seizures and myoclonic syndromes [11, 14]. Many patients develop delayed progressive secondary brain injury (post-ischaemic-anoxic encephalopathy) characterised by dementia, Parkinson's syndrome and problems with co-ordination and/or paresis [5].

The dynamics of cognitive and neurological symptoms in successive phases of post-cardiac arrest syndrome remain poorly understood. Despite studies of early [10] or chronic stage impairments after OHCA [14, 15], little is known about the natural course of recovery, patterns of chronic impairment, rehabilitation needs, or the effectiveness of therapies [16]. It has been postulated that rehabilitation should be modelled on principles established for other sudden brain injuries [14]. Accordingly, rehabilitation should be comprehensive, conducted in specialised units and started early post-injury when the patient is stable [17, 18]. For patients with consciousness disorders, environmental management, passive physiotherapy, and sensory stimulation are provided, and deep brain stimulation techniques show promise. For less severely impaired

patients, progressive training addresses impaired cognitive and sensorimotor functions, and compensatory techniques, occupational therapy, environmental modifications and behavioural adaptation are recommended. Pharmacotherapy may be useful, but the data is limited [14].

The aim of this study was to assess the prevalence, types, severity and natural course of cognitive and neurological impairments due to post-OHCA brain injury within the initial 12 months after occurrence and to estimate patients' neurorehabilitation needs in a sample of OHCA survivors admitted to one Polish cardiology department.

METHODS

Participants

This prospective study was conducted from September 2006 to December 2008 (28 months) at the 1st Department of Cardiology, Medical University of Warsaw, which serves an urban population of 250,000 adults. It is a highly specialised cardiology centre with an 18-bed Cardiac Intensive Care Unit (CICU) for round-the-clock treatment of patients with acute coronary syndromes, decompensation of heart failure and serious arrhythmias.

We screened all patients admitted consecutively to the CICU with an OHCA diagnosis. Included patients were followed for up to 12 months post-OHCA. Inclusion criteria were as follows: (1) first ever nontraumatic, normothermic cardiac arrest; (2) age \leq 75 years; (3) survival until cardiology ward discharge; and (4) no history of pre-existing brain disease. Enrolled patients were grouped according to their ability to co-operate during the diagnosis and rehabilitation process.

The institutional Bioethics Committee approved this study, and patients or their relatives provided written informed consent.

Procedure

Participants were assessed four times by the same clinical neuropsychologist (AP) and neurologist (ŚS). This was done within the first few days after OHCA (early recovery phase), and three (early neurorehabilitation phase), six and 12 months (chronic phase) later. The first evaluation was performed at the cardiology ward; at follow-up, patients were seen in medical units or, if discharged, at the Institute of Psychiatry and Neurology in Warsaw.

Neuropsychological assessment was based on cognitive screening and standardised tests when possible. The first screening was performed as soon as the patient was able to meet testing demands (within days post-OHCA). Screening was performed using Addenbrooke's Cognitive Examination-Revised (ACE-R), which covers orientation, attention, memory, verbal fluency, language and visuo-spatial ability. More comprehensive cognitive examinations, performed with the ACE-R 3–12 months post-OHCA, included tests of attention and motor speed (Trail Making Test-A), memory

and learning (Rey's Auditory Verbal Learning Test, Digit Span Forward, Benton Visual Retention Test), executive functions (Trail Making Test-B, Wisconsin Card Sorting Test), language (spontaneous speech, naming tasks) and visuo-spatial skills (Rey's Complex Figure Test). Clinical analysis of test results, performed by an independent clinical neuropsychologist (KP), evaluated the type and severity level (mild, moderate, severe, or very severe) of the cognitive disorders.

Neurological examination included assessment of cranial nerves, muscle strength and tone, deep tendon reflexes, cerebellar function, sensory function, and gait. Deficits not causing significant disability, such as asymmetric or pathological reflexes, facial nerve paresis or ophthalmoparesis, were defined as subtle neurological signs. Hemi- or tetraparesis, ataxia, parkinsonism, dysarthria, dysphagia and seizures were defined as important neurological symptoms associated with functional disability [19]. Coma, vegetative state (VS), and minimally conscious state (MCS) [14] were considered severe brain dysfunctions.

Changes in physical and mental functioning during the course of recovery were monitored using the Disability Rating Scale (DRS) [20]. The DRS has eight items (each rated on three- to five-point scales) that assess arousal, awareness and responsibility, cognitive ability for self-care activities, dependence on others and psychosocial adaptability. The overall DRS score categorises patient disability as follows: none (score = 0), mild (score = 1), partial (score = 2–3), moderate (score = 4–6), moderate to severe (score = 7–11), severe (score = 12–16), extremely severe (score = 17–21), VS (score = 22–24), and extreme VS (score = 25–29). DRS scores were used to distinguish unconscious or VS, i.e. 'unresponsive' patients vs. those capable of at least minimal conscious co-operation i.e. 'co-operative' patients. The latter group was additionally dichotomised for significant (partial to extremely severe according to DRS classification) vs. mild disability in DRS.

Deficit characterisation was used to estimate indications for specialised neurorehabilitation. Although early screening during the spontaneous recovery phase of OHCA seems to differentiate patients with and without long-term cognitive impairment [21], clinical symptoms in the post-acute phases usually help set more realistic therapeutic goals. Therefore we estimated rehabilitative needs based on the clinical state three months post-OHCA and monitored changes during subsequent evaluations. Therapy for VS patients (passive physiotherapy, sensory stimulation) [14] does not require specialised neurorehabilitation centres. However, if these patients recover while staying at a residential medical care facility or at home, they should seek rehabilitation as soon as possible. Patients with mild to extremely severe disorders that cause disability were assessed as needing specific impairment-oriented therapy.

We estimated the rehabilitation needs of OHCA survivors in Poland based on our patient rehabilitation needs data. The OHCA population size in Poland was estimated using data

from the Central Statistical Office in Poland [22] and OHCA incidence data [2]. The number of patients requiring neurorehabilitation was used to estimate the annual maximum number of person-days of rehabilitation (number of patients multiplied by the maximum allowed in-hospital stay at neurorehabilitation units, i.e. 16 weeks) and to estimate the number of beds needed for professional neurorehabilitation (number of person-days times 365 days a year).

'Estimated needs' refers to needs during the early neurorehabilitation phase for optimal recovery [10].

Statistical analysis

SPSS v. 15 was used for statistical analyses. Descriptive statistics (frequencies and percentages and means with standard deviations) were used to report the data. Changes in symptom severity of each cognitive domain and changes in disability level in consecutive evaluations were assessed with the Friedman test to investigate dynamics of recovery from OHCA.

RESULTS

OHCA survivors

During the 28-month study period, 69 patients were admitted to the CICU after resuscitation. Of these, 58 were alive for an initial screening evaluation during the first days post-OHCA. A total of 33 (47.8%) survived until discharge from the cardiology unit (mean hospitalisation time 21 ± 11.7 days).

Of the 33 discharged patients, 29 (26 men and three women; mean age 58.4 ± 10.3 years) met the study criteria. Four patients were excluded from the study because of age (> 75 years; $n = 2$), preexisting stroke ($n = 1$) or alcohol abuse ($n = 1$). Ten of the selected patients died within 12 months post-OHCA. Figure 1 shows a study flowchart.

Post-OHCA neuropsychological and neurological deficits and disability levels

At 3 ± 1 days after OHCA, of 29 patients, eight (27.6%) had severe consciousness disorders, with tetraparesis in six (20.7%) cases; 21 (72.4%) co-operated to some extent. All co-operating patients had cognitive abnormalities. Twelve revealed deficits in three or more cognitive domains, including memory impairment (85.7%) and executive (61.9%), attentional (47.6%), language (anomia: 47.6%) and visuo-spatial (33.3%) dysfunctions. None of the patients had essential perceptual deficits (e.g. hemianopia or visual agnosia). Eighteen (87.5%) patients had neurological deficits, which co-existed with multi-domain cognitive decline in ten (47.6%) cases. Most (71.4%) patients had significant functional disability, but a spectrum of disability levels was observed.

Three months after OHCA, four of 21 (19%) patients remained in a VS with tetraparesis; 17 (80.9%) were able to co-operate. Of the co-operating patients, 13 (76.5%) had cognitive impairments (eight had three or more deficits) that, in ten (58%) cases, coexisted with neurological symptoms:

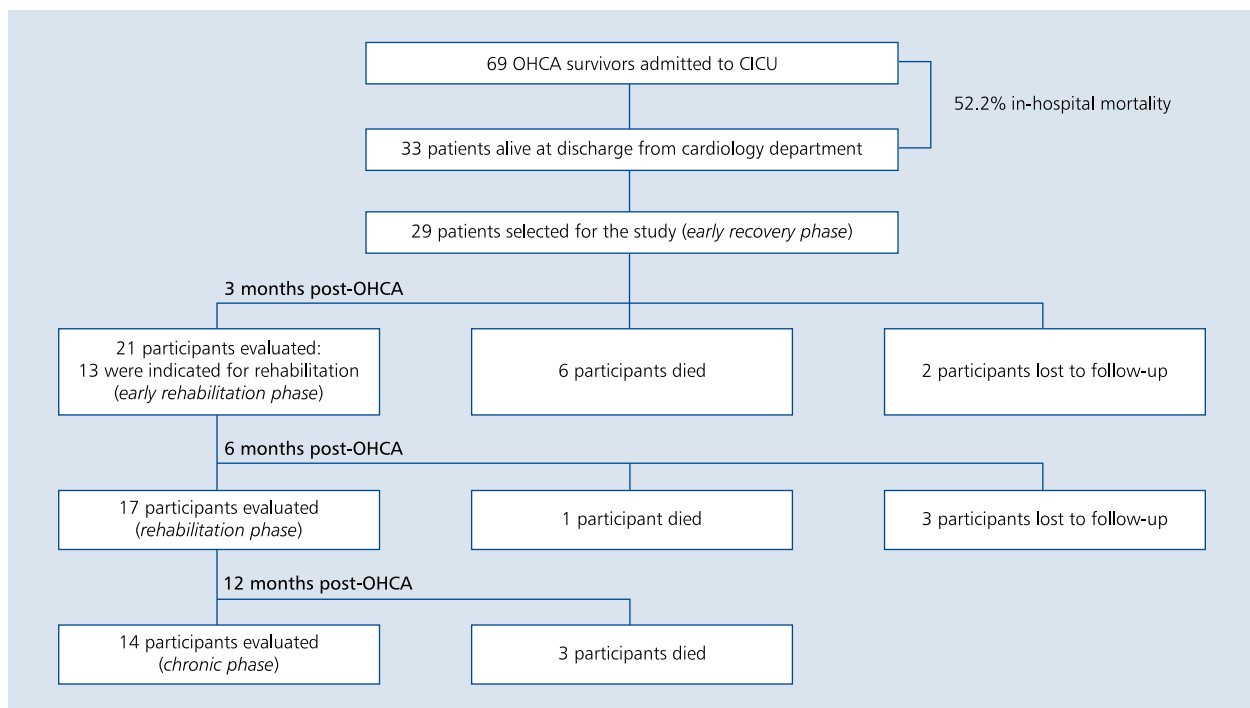


Figure 1. Patient flow through the study; OHCA — out-of-hospital cardiac arrest; CICU — cardiac intensive care unit

eight had subtle symptoms, while two who recovered from VS had tetraparesis. Cognitive abnormalities in these patients included impairments in memory (94.1%) or in executive (58.8%), attention (47%), language (41.1%), and visuo-spatial (23.5%) functioning. Ten (58%) had significant disabilities.

Six months post-OHCA, three of 17 (17.7%) patients were in a VS (one case with tetraparesis), and 14 (82.3%) could co-operate. Of the 14, eight (57.1%) had cognitive impairments (five had three or more impairments); six also showed neurological signs, and one had tetraparesis (total 50%). The cognitive impairments included deficits in memory (71.4%) and in executive (35.7%), language (35.7%), attentional (21.4%) and visuo-spatial (14.3%) functions. Significant disability was present in 50% of the patients.

Fourteen patients were able to co-operate 12 months post-OHCA, although eight (57.2%) had cognitive deficits (two in at least three domains), six (42.8%) had subtle neurological deficits, and one recovered from the VS but was in a MCS with tetraparesis. Some had cognitive deficits in memory (64.3%), executive (21.4%), language (14.3%) and visuo-spatial functions (14.3%). None had functionally relevant attention disturbances, but 35.7% had still significant disabilities.

Using the Friedman test to analyse recovery from post-cardiac arrest brain damage only revealed a significant improvement within one year in attention disorders ($\chi^2 = 10.317$, $p = 0.016$). Both executive ($\chi^2 = 7.227$, $p = 0.065$) and visuo-spatial ($\chi^2 = 7.227$, $p = 0.065$) disorders tended to decrease over time, but the differences were not significant.

Memory ($\chi^2 = 3.915$, $p = 0.27$) and linguistic ($\chi^2 = 4.167$, $p = 0.24$) disturbances improved the least from the early phase to 12-months post-OHCA. Table 1 shows the severity of cognitive deficits during the 12 months post-OHCA. Regarding the level of disability as measured by DRS (Table 2), the Friedman test also showed a statistically significant improvement ($\chi^2 = 16.775$, $p = 0.001$) during the 12-month study period.

Estimated neurorehabilitation demand

Three months after OHCA, 13 of 17 co-operative patients (76.5%) had indications for rehabilitation. Of these, nine needed neuropsychological therapy, and four needed both neuropsychological and physical therapy. Follow-up showed that two patients who initially had mild deficits improved spontaneously between three and six months post-OHCA and did not require further therapy. One patient recovered from a VS to a MCS during the 12-month period, and thus qualified for specialised neurorehabilitation.

To the best of our knowledge, only three of these patients participated in therapy in formal settings. Due to differences in their level of disability (moderate, severe, extremely severe) and the very small sample, the treatment effects are difficult to compare.

About 139 patients per year suffer from OHCA in the geographic area served by our department of cardiology [2]; thus, we would expect ~325 people to have OHCA during the 28-month study period. Only 69 OHCA patients were admitted to the CICU. In this study, the pre-hospital mortality rate was 79%.

Table 1. Cognitive deficit severity in post-cardiac arrest syndrome patients at the indicated times post-event

	3 ± 1 day (n = 29)	3 months (n = 21)	6 months (n = 17)	12 months (n = 14)	P (Friedman test)
Co-operative patients	n = 21	n = 17	n = 14	n = 14	–
Attention:					
Mild	4	5	2	0	–
Moderate	4	0	0	0	–
Severe	0	1	1	0	–
Very severe	2	2	0	0	–
Mean severity level (SD)	1.2 (1.6)	0.7 (1.2)	0.1 (0.3)	0 (0)	0.016
Memory:					
Mild	3	4	2	3	–
Moderate	4	4	3	2	–
Severe	5	4	5	4	–
Very severe	6	4	0	0	–
Mean severity level (SD)	2 (1.7)	2 (1.2)	1.7 (1.1)	1.8 (1.2)	0.54
Executive:					
Mild	7	5	3	2	–
Moderate	4	1	1	1	–
Severe	0	1	0	0	–
Very severe	2	3	1	0	–
Mean severity level (SD)	1.2 (1.6)	0.8 (1.2)	0.3 (0.5)	0.2 (0.4)	0.065
Visuo-spatial:					
Mild	3	1	1	2	–
Moderate	2	0	0	0	–
Severe	0	0	0	0	–
Very severe	2	3	1	0	–
Mean severity level (SD)	1 (1.6)	0.4 (1.3)	0.1 (0.3)	0 (0)	0.08
Language:					
Mild	5	3	3	2	–
Moderate	3	1	1	0	–
Severe	0	1	1	0	–
Very severe	2	2	0	0	–
Mean severity level (SD)	1 (1.7)	0.6 (1.3)	0.4 (0.7)	0.1 (0.3)	0.24
Unresponsive patients	n = 8	n = 4	n = 3	n = 0	–

Figures are absolute numbers unless otherwise specified. Severity levels range from 0 (none) to 4 (very severe); SD — standard deviation

Based on the rehabilitation needs of the study participants as assessed three months post-OHCA, we estimate that in Poland, of 21,213 people per year with OHCA, 822 patients will develop neuropsychological and/or neurological symptoms requiring specialised neurorehabilitation. Assuming a maximum stay of 16 weeks, this predicts a need for ~250 beds in dedicated neurorehabilitation hospitals.

DISCUSSION

The results of this pilot study illustrate the high prevalence, variable clinical picture and dynamic natural course of cog-

nitve and neurological impairments in patients during the initial 12 months after OHCA. The results also illustrate the neurorehabilitative needs in this population, who typically have cognitive and/or physical disabilities.

OHCA survivors are heterogeneous in terms of clinical status. Earlier studies [14, 21, 23] demonstrated that the functional consequences of brain injury range from complete recovery to mild cognitive deficits to severe cognitive-behavioural and motor impairments, MCS or even permanent VS [10]. Although massive and variable impairments usually occur early after OHCA [11], the most frequent in the post-acute

Table 2. Levels of disability in post-cardiac arrest syndrome patients at the indicated times post-event

Levels of disability	3 ± 1 day (n = 29)	3 months (n = 21)	6 months (n = 17)	12 months (n = 14)	P (Friedman test)
Co-operative patients	n = 21	n = 17	n = 14	n = 14	–
None (DRS score 0)	2	5	7	7	–
Mild (DRS score 1)	4	2	0	1	–
Partial (DRS score 2–3)	4	5	6	5	–
Moderate (DRS score 4–6)	6	1	0	0	–
Moderate to severe (DRS score 7–11)	2	1	0	0	–
Severe (DRS score 12–16)	2	0	1	0	–
Extremely severe (DRS score 17–21)	1	3	0	1	–
Mean DRS level (SD)	7.8 (9.4)	4.3 (7.9)	2.6 (6.2)	2.5 (5.9)	0.001
Unresponsive patients (DRS score 22–29)	n = 8	n = 4	n = 3	n = 0	–

Figures are absolute numbers unless otherwise specified; DRS — Disability Rating Scale; SD — standard deviation

phases are memory and executive abnormalities, sometimes coupled with subtle motor deficits. In contrast, aphasia and perceptual impairments are rare [8–10, 14, 15].

Our findings are in accordance with earlier studies. The most frequent early post-OHCA impairment was severe consciousness disorders (28%); no VS was noted 12 months post-OHCA due to mortality or recovery. Among the co-operative patients, all had cognitive impairments during the first post-OHCA days, and roughly half had cognitive impairments 12 months later. As in previous studies, memory and learning deficits were the most common and severe manifestations at every time point, and cognitive problems were observed in all long-term survivors. The vulnerability of hippocampal structures, especially the CA1 area, and neocortical systems to oxygen deprivation is the main cause of memory problems [12, 14, 24]. However, due to diffuse hypoxic-ischaemic brain injury, isolated memory impairments ('pure' anterograde amnesia) are very rare [9, 12]. None of our patients had only amnesia when first tested, but two patients who initially had mild cognitive deficits had mild memory problems as their sole symptom three months post-OHCA. Executive and attentional deficits were less frequent and usually less severe, followed by language and visuo-spatial disturbances.

The neurological deficit prevalence in co-operative patients ranged from 88% in the first few days post-OHCA to 43% 12 months post-OHCA. As in previous studies [9, 14, 15], subtle neurological symptoms coexisted with multi-domain cognitive decline. Severe motor disorders (e.g. paresis) were noted only in patients with multiple serious cognitive impairments who recovered from severe consciousness disorders. Due to acquired deficits, especially cognitive impairments, between 71% (early post-OHCA) and 36% (12 months post-OHCA) of patients were significantly disabled and often dependent.

The mechanism and dynamics of functional recovery after OHCA-related brain injury remain poorly understood. Regarding cognitive impairments, only 5% of patients achieve full remission during the first months post-OHCA, and 20–50% suffer from various long-term dysfunctions that affect the quality of life of patients and their families [14, 25]. Clinical observations indicate that inpatient rehabilitation of multi-disabled OHCA patients resulted in slow but relevant functional improvement, although the realistic goals of the therapy and its effectiveness are somewhat variable among individual patients [16]. Some studies [14, 25] indicate that the greatest recovery occurs in the first three months, while others [9] suggest that improvement is most likely to appear later, with executive functioning having the most prolonged course of recovery [14].

In our study, the general clinical state of patients, as measured by DRS, improved significantly within the observation period. Regarding cognitive abilities, the only significant improvement concerned attention, although other disorders also tended to diminish.

Disorders in 76% of co-operative patients at three months post-OHCA indicated the need for specialised cognitive and/or physical rehabilitation. Based on this, we estimate that in Poland there is a need for ~250 beds in rehabilitative centres. Note, however, that previously unconscious patients may recover and need neurorehabilitation. Although the chances of regaining awareness decrease as time passes, a few cases may recover from persistent VS to a state of severe disability [26]. There were three such cases in our study, one at the end of the 12-month observation period.

Neurorehabilitation needs must be estimated to plan integrated care and rehabilitation for OHCA survivors. Effective, specific therapies should be adapted after considering techniques used for people with acquired brain injury due to other aetiologies.

Limitations of the study

This study has several limitations, and the findings may differ in other populations of OHCA survivors. The limitations include: 1) a relatively small sample size and heterogeneous cardiac arrest characteristics; 2) the included adult patients from urban populations were treated in only one cardiology centre with a large, highly specialised CICU (the overall survival rate and outcomes depend on resuscitation, which may be delayed in rural areas); 3) there was no analysis of the impact of depression on cognitive performance or analysis of resuscitation-related variables that affect long-term functioning; 4) there was possible underestimation of the number of beds needed for neurorehabilitation, since we only included patients capable of co-operating and cardiogenic cases of OHCA (aetiologies like trauma, drug overdose, asphyxia, exsanguinations and intoxication were excluded) and — this number of beds may not meet patients' therapeutic needs at later post-OHCA times; and 5) the study was conducted prior to the introduction of therapeutic hypothermia, which may modify rates of long-term neurologically intact survival.

CONCLUSIONS

This study confirmed that cognitive, especially amnesic, dysfunctions and neurological deficits are common consequences of ischaemic-hypoxic brain injury due to OHCA. Although most symptoms are present early after brain injury, approximately half of survivors suffer from long-term deficits that limit independent activity and social participation. Establishing specialised neurorehabilitation centres and developing effective rehabilitation interventions is essential for the treatment and care of these patients.

This study was funded by the National Cardiovascular Diseases Prevention and Treatment Programme POLKARD 2006–2008.

Conflict of interest: none declared

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Neuropsychologiczne i neurologiczne konsekwencje pozaszpitalnego nagłego zatrzymania krążenia z oszacowaniem potrzeb neurorehabilitacyjnych: prospektywne badanie pilotażowe

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Streszczenie

Wstęp: Rozlane uszkodzenie mózgu jest zasadniczym elementem zespołu poresuscytacyjnego, opisywanym u 30–80% chorych z pozaszpitalnym nagłym zatrzymaniem krążenia (NZK), odpowiadającym za wysoką śmiertelność oraz deficyty poznawcze i neurologiczne prowadzące do niepełnosprawności. Różnorodność i dynamika objawów oraz możliwości rehabilitacji pacjentów po NZK są słabo poznane.

Cel: Celem prospektywnego badania pilotażowego była ocena częstości, rodzaju, nasilenia i dynamiki zaburzeń poznawczych oraz neurologicznych u chorych w pierwszych 12 miesiącach od poresuscytacyjnego uszkodzenia mózgu, a także próba oszacowania potrzeb neurorehabilitacyjnych tej grupy pacjentów.

Metody: Spośród osób po NZK, przyjmowanych kolejno na oddział intensywnej opieki kardiologicznej (OIOK), zabezpieczającego rejon 250 000 mieszkańców Warszawy, rekrutowano uczestników badania wg następujących kryteriów włączenia: pierwsze w życiu nieurazowe, normotermiczne zatrzymanie krążenia; wiek ≤ 75 lat; przeżycie do czasu wypisu z oddziału kardiologicznego; brak wcześniejszych chorób mózgu. Rodzaj nabytych zaburzeń poznawczych i neurologicznych oraz stopień niepełnosprawności chorych badano w pierwszych dniach po NZK a także 3, 6 i 12 miesięcy później. Badanie neuropsychologiczne miało na celu ocenę funkcji uwagi, pamięci, zdolności wykonawczych, językowych i wzrokowo-przestrzennych. W badaniu neurologicznym oceniono nerwy czaszkowe, siłę i napięcie mięśniowe, odruchy głębokie, czucie, funkcje mózdzku i chód. Ogólny poziom funkcjonowania psychofizycznego pacjentów klasyfikowano wg Skali Oceny Niepełnosprawności (*Disability Rating Scale*). Potrzeby rehabilitacyjne badanych określono na podstawie wyników zebranych w 3. miesiącu po NZK. Dane te posłużyły następnie do oszacowania potrzeb neurorehabilitacyjnych chorych po NZK w Polsce.

Wyniki: W ciągu 28 miesięcy trwania badania, spośród 69 chorych po NZK przyjętych na OIOK, 29 pacjentów spełniło kryteria badania (33 osoby przeżyły do czasu wypisu z oddziału kardiologicznego; 4 osoby nie spełniły dalszych kryteriów włączenia). Głębokie zaburzenia świadomości notowano najczęściej we wczesnej fazie po NZK (28%); 12 miesięcy później nie było chorych całkowicie niezdolnych do reagowania na otoczenie (związek z poprawą funkcjonalną i śmiertelnością osób z ciężkim uszkodzeniem mózgu). Wśród chorych podejmujących współpracę podczas badań, od 100% (wcześnie po NZK) do 57% (12 miesięcy po NZK) pacjentów wykazywało zaburzenia poznawcze współistniejące zazwyczaj z objawami neurologicznymi. Zaburzenia pamięci okazały się najczęstszym i najpoważniejszym problemem. Mniej nasilone były deficyty wykonawcze, uwagowe, językowe (głównie anomia) i wzrokowo-przestrzenne. Częstość występowania objawów neurologicznych wahała się od 88% (wczesna faza po NZK) do 43% (12 miesięcy po NZK). W konsekwencji nabytych zaburzeń od 71% (wcześnie po NZK) do 36% (12 miesięcy po NZK) chorych było znacząco niesprawnych i często zależnych od otoczenia.

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Praca wpłynęła: 18.12.2013 r.

Zaakceptowana do druku: 20.03.2014 r.

Data publikacji AoP: 01.04.2014 r.

Chociaż zaburzenia cechowała tendencja do zmniejszania się wraz z upływem czasu od zachorowania, po 12 miesiącach od NZK ponad 50% chorych nadal wykazywało deficyty, a ponad 30% znaczną niesprawność. Wyniki badań przeprowadzonych w 3. miesiącu po NZK pokazały, że wśród chorych zdolnych do podjęcia współpracy aż 76% osób wymagało terapii: najczęściej rehabilitacji neuropsychologicznej, rzadziej — terapii neuropsychologicznej i fizjoterapii. Dane te pozwoliły oszacować, że w Polsce rocznie ok. 800 osób po NZK może doświadczać zaburzeń wymagających specjalistycznej neurorehabilitacji.

Wnioski: Zaburzenia poznawcze (szczególnie deficyty pamięci i uczenia się) wraz z objawami neurologicznymi są częstymi następstwami poresusycyjnego uszkodzenia mózgu. Tworzenie centrów neurorehabilitacyjnych dla chorych po NZK jest niezbędne w ich terapii. Specjalistyczna neurorehabilitacja powinna rozpocząć się krótko po uszkodzeniu mózgu i ustabilizowaniu stanu ogólnego, powinna być intensywna i wszechstronna (rehabilitacja neuropsychologiczna, fizjoterapia, terapia zajęciowa, modyfikacje środowiskowe, adaptacja do funkcjonowania z nabytym deficytem).

Słowa kluczowe: objawy mózgowo, neurorehabilitacja, zatrzymanie krążenia

Kardiologia 2014; 72, 9: 814–822



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Główne tematy:

- Rzadkie choroby krążenia systemowego i płucnego
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- Wady wrodzone
- Choroby układu krążenia u ciężarnych
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ABSTRAKTY można zgłaszać **w terminie do 30.09.2014 r.**

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