

Functioning of the Integrated System of Care for Stroke Patients Treated with Mechanical Thrombectomy Based on the Case Report

Funkcjonowanie zintegrowanego systemu opieki nad chorymi po udarze mózgu leczonymi trombektomią mechaniczną na podstawie opisu przypadku

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Abstract

Introduction. Mechanical thrombectomy is a treatment method used in the event of ischemic stroke, caused by obstruction of a large artery. This method is used to treat stroke in its acute phase. An integrated health care system is about placing the patient in need of help at the centre of the procedure. In such a system, the patient receives support and treatment methods in various fields and from various specialists.

Aim. The aim of the work is to present the issue of introduction and implementation of the program of treatment of patients after stroke by means of mechanical thrombectomy.

Case Report. The research material in the work was medical documentation of patients of the neurology department, and scientific literature. The research method was the individual case method, analysis of literature and medical documentation.

Conclusions. A very well-implemented pilot program of mechanical thrombectomy treatment, with specific guidelines, standards, rules of conduct, contact methods, contributes to reducing mortality due to ischemia strokes. (JNNS 2023;12(2):92–97)

Key Words: mechanical thrombectomy, integrated care system

Streszczenie

Wstęp. Trombektomia mechaniczna jest metodą leczenia stosowaną w przypadku udaru niedokrwienego mózgu, spowodowanego niedrożnością dużej tętnicy. Metodę tę stosuje się w leczeniu udaru mózgu w jego ostrej fazie. Zintegrowany system opieki zdrowotnej polega na umieszczeniu pacjenta potrzebującego pomocy w centrum procedury. W takim systemie pacjent otrzymuje wsparcie i metody leczenia z różnych dziedzin i od różnych specjalistów.

Cel. Celem pracy jest przedstawienie zagadnienia wprowadzenia i realizacji programu leczenia chorych po udarze mózgu metodą trombektomii mechanicznej za pomocą analizy opisu przypadku.

Opis przypadku. Materiałem badawczym w pracy była dokumentacja medyczna pacjentów oddziału neurologii oraz literatura naukowa. Metodą badawczą była metoda indywidualnego przypadku, analiza literatury i dokumentacji medycznej.

Wnioski. Bardzo dobrze zrealizowany pilotażowy program leczenia trombektomii mechanicznej, zawierający szczegółowe wytyczne, standardy, zasady postępowania, metody kontaktu, przyczynia się do zmniejszenia śmiertelności z powodu udarów niedokrwienych mózgu. (PNN 2023;12(2):92–97)

Słowa kluczowe: trombektomia mechaniczna, zintegrowany system opieki, udar niedokrwieny mózgu

Introduction

In an integrated healthcare system, actions are based on authenticated and up-to-date medical knowledge. They aim to minimize the negative effects of the disease and ensure the patient's good quality of life after leaving the hospital. The teams providing their services in an integrated manner stand out for their high organizational efficiency and a high level of expertise [1].

The phenomenon of integrated patient care is not yet widespread in Poland. This is due to the existing system of settlements with the National Health Fund (NFZ), which does not promote such an approach to patient care. In the current system, individual procedures are scored, for which the hospital or other healthcare unit receives payment, rather than a comprehensive approach to the treated condition. In such an approach, the patient is not the priority, but rather the profit and profitability of the procedure. This also generates another problem. In such a system, the patient becomes heavily involved in the provision of services. For example, upon leaving the hospital, they receive a referral for rehabilitation without specifying the time and place. Therefore, they have to find a facility themselves where they can receive the services. Thus, there is no talk of comprehensive care that would guarantee the highest efficiency in the patient's healing process [2].

The solution to this problem was supposed to be the introduction of a coordinated care system by the Ministry of Health. However, this is still not synonymous with an integrated system. Under coordinated care, the patient quickly gets referred to a specialist after the initial visit to a primary care physician, which seems beneficial for them. However, the specialist still bills individual procedures. Thus, we return to the starting point, which is the influence of procedure funding on the treatment approach. Therefore, this system only partially solves the problem [3].

Therefore, the integrated care system appears to be the most beneficial solution for patients, especially in aging societies, including Poland. Elderly patients requiring treatment are characterized by multimorbidity, which necessitates the involvement of specialists from various fields in their therapy [4].

Characteristic of this system is the inclusion of multiple actions in a single procedure, such as surgical intervention, early rehabilitation, dietary treatment, educational activities, wound care, support from a social worker, and even pharmaceutical support.

The proposal to introduce an integrated healthcare system in Poland emerged after the implementation of the International Research Project under the 7th Framework Program of the European Union — “Financing Quality in Healthcare — InterQuality”, for which Tomasz Hermanowski was responsible. The

results of this project clearly highlighted the role of interdisciplinary teams in achieving the best health outcomes for patients. Fragmentation of treatment and lack of continuity result in increased healthcare costs and inefficient treatment, leading to patient dissatisfaction.

An example of the application of an integrated system can be found in invasive cardiology, where in order to receive payment for the procedure, the patient must also have guaranteed comprehensive post-procedural care, which includes, among other things, a dietitian or access to a sanatorium.

The need for the introduction of an integrated care system is also recognized by specialists in neurosurgery, especially in the case of treating stroke patients. This clinical unit is already being treated in our country with fairly high efficiency, at a European level. However, it is necessary to integrate hospital treatment with post-discharge care and ensure accessibility to rehabilitation [5,6].

The role of the Primary Stroke Centers, of which there are 18 in Poland, is to fulfill these functions. These centers have been established in large medical facilities equipped with stroke units, interventional radiology, neuroimaging laboratories, and magnetic resonance imaging, as well as neurosurgery departments. Comprehensive stroke treatment should also include medical rehabilitation, both early and secondary, which encompass physiotherapy, occupational therapy, speech therapy, neuropsychotherapy, and nursing care.

The University Clinical Hospital in Wrocław (USK) offers the method of mechanical thrombectomy for stroke treatment in the southern region of Poland. Another center in the southern part of Poland is located in Opole, where the Wojewódzki Szpital Specjalistyczny im. św. Jadwigi performs thrombectomy procedures. While the number of centers included in the pilot program for mechanical thrombectomy treatment of stroke may seem limited, it is important to consider the strict requirements that a reference center must meet, as specified in the Regulation of the Minister of Health. Not every healthcare facility can provide a team consisting of six specialists (radiodiagnostician, radiologist, neurotraumatologist, neurosurgeon, neurologist or cardiologist, and radiographer) on a daily, 24-hour basis. Therefore, considering these conditions, it is recommended to implement mechanical thrombectomy treatment in at least one center in each voivodeship.

In centers providing services in this scope, procedures have been developed for the management of patients in the acute phase of ischemic stroke to standardize the approach of medical personnel at various stages of mechanical thrombectomy treatment. Through these procedures, delays in treatment can be eliminated, early detection of ischemic stroke can be ensured, patients

can be rapidly qualified for treatment, the number of patients with high neurological deficits can be reduced, and mortality can be reduced.

By adhering to these procedures, the number of mechanical thrombectomy procedures performed increases, and the time from hospital admission to treatment implementation can be shortened to below 50 minutes.

The approach is based on the inclusion and exclusion criteria for mechanical thrombectomy treatment established by the European Stroke Initiative (EUSI). Patients eligible for this treatment method are also evaluated using the National Institutes of Health Stroke Scale (NIHSS).

The patient must also provide informed consent for the treatment.

After the procedure, the patient should be transferred to the postoperative unit (recovery room, post-anesthesia care unit), where they are closely monitored by qualified nursing staff. The patient's condition is observed and recorded every 15 minutes for the first 2 hours after the procedure and then every 30 minutes for 8 hours post-procedure.

Case Presentation

An 80-year-old woman with a history of hypertension and atherosclerosis was brought to the Emergency Department of the Specialist Hospital in Wałbrzych by the Emergency Medical Services team at 11:22 AM with suspected ischemic stroke of the right hemisphere. The first stroke symptoms were noticed by the family at approximately 9:50 AM.

Upon admission, the patient was drowsy, arousable to verbal stimuli. The heart rate was measured at around 100 beats per minute, and blood pressure was 175/85 mmHg. Left-sided hemiparesis was present. From the medical history, it was noted that the patient was not taking any anticoagulant medications. The patient was referred for a head CT scan (CT scan results: Early phase of ischemia. Complete absence of flow in the right middle cerebral artery (MRCA) territory, facial nerve palsy, and conjugate gaze palsy). Subsequently, an angio-CT scan was performed (Angio-CT scan results: Presence of a clot in the cerebral artery).

After 37 minutes, at 11:59 AM, the patient was transferred to the stroke unit of the same hospital with a diagnosis of ischemic stroke of the right hemisphere, severe left-sided hemiparesis, dysarthria, atherosclerosis, and cerebral artery occlusion.

Further Management

After excluding contraindications, the patient was administered a bolus of Alteplase (5.4 mg) at 11:50 AM. Following consultation with the University Clinical Hospital in Wrocław, the patient was transferred to that hospital for mechanical thrombectomy.

Before transferring the patient, the necessary medical documentation was prepared, and the Alteplase infusion was initiated. Vital signs remained within normal limits during transport.

The patient was admitted to the University Clinical Hospital at 1:48 PM. The mechanical thrombectomy procedure was performed at 1:50 PM and lasted for 1 hour and 10 minutes.

After the procedure, the patient was transferred to the postoperative ward. The two-hour post-procedure course was uneventful. Following initial observation, the patient was transferred to the neurology department.

Conclusions from the Management

The time from symptom onset to admission to the Emergency Department was over one and a half hours. The lack of information about the time of the emergency call made by the patient's caregiver does not allow us to determine the cause of this delay.

The performed imaging diagnostics in the Emergency Department helped rule out hemorrhagic stroke and establish a diagnosis of ischemic stroke (based on the early stroke symptoms, such as cortical-subcortical blurring in the area of ischemia).

The correct interpretation of the imaging tests, along with a properly obtained medical history, allowed for the application of standard treatment in the form of Alteplase administration.

The initial bolus dose of Alteplase and the maintenance dose via intravenous infusion were administered according to the guideline, calculating the dosage based on body weight.

The time from the patient's admission to the Emergency Department to transfer to the stroke unit was only 37 minutes. It should be noted that during this time, numerous imaging tests were performed.

The time from admission to the stroke unit to transfer to the University Clinical Hospital was just under 2 hours, taking into account the distance covered by the Emergency Medical Services.

Early communication with the vascular department and pre-registration of the patient allowed for bypassing procedures in the Emergency Department and direct transfer of the patient to the procedure.

As evident from the presented case, the functioning of the pilot program in the Lower Silesia region is effective, enabling patients to regain their chances of full recovery after an ischemic stroke.

Discussion

Mechanical thrombectomy is a minimally invasive method for treating ischemic strokes, known worldwide. Several years ago, the superior efficacy of mechanical thrombectomy over medical recanalization of occluded cerebral arteries was recognized in terms of reducing mortality and increasing the level of independence in daily functioning. The refinement of this method is described in the article “Intracranial thrombectomy using the Solitaire stent: a historical vignette” by Marta Perez, which describes a case of a 67-year-old woman treated with this method as early as 2008. This patient achieved a NIHSS score of 10 during the qualification process for the procedure, and 30 days after the procedure, the score was reduced to 0 [7].

The presented case demonstrates the successful implementation of mechanical thrombectomy in the context of acute ischemic stroke. The patient was promptly assessed and diagnosed, and the necessary interventions were initiated without significant delays. The coordination between the Emergency Department, stroke unit, and University Clinical Hospital facilitated the smooth transfer of the patient for the mechanical thrombectomy procedure, leading to a positive post-procedure course without complications.

The prompt administration of Alteplase and subsequent mechanical thrombectomy contributed to the restoration of blood flow and reduction of ischemic damage in the affected area of the brain. The post-procedure monitoring and transfer to the neurology department ensure continued care and observation of the patient’s neurological status.

This case highlights the importance of an integrated system of care for stroke patients, where various medical disciplines collaborate to provide comprehensive and timely treatment. The successful implementation of mechanical thrombectomy as a treatment modality for acute ischemic stroke has the potential to improve patient outcomes, reduce disability, and enhance the chances of a full recovery.

Further research and implementation of mechanical thrombectomy in stroke management will contribute to improving stroke care and outcomes, ensuring that more patients have access to this effective treatment option.

The research on the effectiveness of mechanical thrombectomy has been ongoing, aiming to make the procedure less invasive and improve long-term treatment

outcomes. A breakthrough occurred in 2015 when five major randomized trials were published, demonstrating the high efficacy and safety of mechanical thrombectomy compared to the previously used pharmacological treatment method since 1995. These trials showed better functional outcomes, independence, and reduced negative effects of stroke. The Dutch MR CLEAN trial [8], EXTEND-IA study [9], ESCAPE study [10], SWIFT PRIME trial [11], and REVASCAT trial [12] were among these groundbreaking studies.

The MR CLEAN trial demonstrated a significantly higher rate of functional independence in patients treated with mechanical thrombectomy compared to standard treatment alone. The EXTEND-IA study showed improved functional outcomes and reduced disability in patients treated with mechanical thrombectomy within 4.5 hours of symptom onset. The ESCAPE trial demonstrated a higher rate of functional independence and reduced mortality in patients treated with mechanical thrombectomy within 12 hours of symptom onset. The SWIFT PRIME trial showed improved functional outcomes and reduced disability in patients treated with mechanical thrombectomy within 6 hours of symptom onset. Lastly, the REVASCAT trial demonstrated improved functional outcomes and reduced disability in patients treated with mechanical thrombectomy within 8 hours of symptom onset.

These landmark trials have provided strong evidence for the effectiveness of mechanical thrombectomy as a standard treatment for eligible ischemic stroke patients. The positive results from these studies have led to a paradigm shift in stroke management, emphasizing the importance of timely mechanical thrombectomy as a primary treatment option for eligible patients.

In 2016, Norberto Kabral et al. published a study in *eNeurologicalSci*, comparing two groups of patients treated between 2014 and 2015 for ischemic stroke using either conventional treatment or mechanical thrombectomy. The analyzed sample size was relatively small, consisting of 82 individuals. However, in the group of patients who underwent mechanical thrombectomy, 45% achieved independence in self-care, whereas in the group treated with pharmacological recanalization, only 27% achieved independence [13].

This study provides further evidence of the superiority of mechanical thrombectomy over conventional treatment methods for ischemic stroke. The higher rate of functional independence observed in the mechanical thrombectomy group suggests that this intervention can significantly improve patient outcomes and their ability to perform activities of daily living.

It is important to note that larger-scale studies and meta-analyses have also consistently shown the favorable outcomes of mechanical thrombectomy in ischemic stroke patients. The results of these studies have influenced

treatment guidelines and led to the integration of mechanical thrombectomy as a standard of care for eligible patients.

The study by Kabral et al. adds to the growing body of evidence supporting the effectiveness of mechanical thrombectomy in improving patient outcomes and functional independence in ischemic stroke. It highlights the potential of this intervention to significantly impact the lives of stroke patients and emphasizes the need for its wider implementation in clinical practice.

The procedures established at the University Clinical Hospital (USK) were developed based on the experiences of European centers and guidelines from global neurological and radiological organizations. All elements of the treatment protocol, drug dosages, timeframes for performing the procedure, and the methods used during the procedure were introduced after analyzing data from foreign centers specializing in this treatment method for a significantly longer time than Poland. Confirmation of this can be found in articles demonstrating the impact of specific treatment procedures on the outcomes of ischemic stroke treatment.

Mathew Evans, in the article “Revolution in acute ischemic stroke care: a practical guide to mechanical thrombectomy”, describes the most effective dosing of rtPA (recombinant tissue plasminogen activator) [14]. The necessity of rapid recanalization of occluded arteries to achieve swift improvement in patient condition within 4.5 hours is discussed by Jeffrey Saver and Werner Hack in the article “Thrombolysis with alteplase 3 to 4.5 hours after acute ischemic stroke” [11].

These articles and others provide valuable insights into the optimization of treatment protocols for acute ischemic stroke. By incorporating evidence-based practices and drawing from the experiences of international centers, the procedures implemented at USK aim to provide the best possible outcomes for stroke patients.

A pilot program for treating strokes in Poland, despite being implemented in 16 centers, might initially seem like a small number for a relatively large country. However, a retrospective analysis of mortality outcomes after mechanical thrombectomy based on the Nationwide Inpatient Sample database in the United States, conducted by Peter Adamczyk et al., demonstrated lower mortality rates in larger, academic centers compared to smaller centers with less developed infrastructure [15].

Taking all these aspects into consideration, it appears that Poland has prepared for the implementation of the program in a highly professional manner, based on evidence-based medicine. This approach ensures that stroke patients in Poland will have access to high-quality treatment. The focus on establishing well-equipped centers and learning from international experiences and research findings demonstrates a commitment to providing the best possible care for stroke patients in the country.

Conclusions

It is necessary to implement social education regarding the recognition and response to emerging cerebrovascular diseases. Only in this way will it be possible to initiate treatment more quickly, limit the extent of deficits after strokes, and thereby increase patients' independence and reduce their dependence on caregivers.

A well-implemented pilot program for mechanical thrombectomy, with specific guidelines, norms, procedural principles, contact methods, contributes to reducing mortality due to strokes.

The introduction of the possibility of pre-registering stroke patients significantly shortens the time it takes for the patient to reach thrombectomy, which is crucial considering the condition of a maximum of 4.5 hours from symptom onset.

Consistent, standardized documentation of stroke patients prevents the omission of any significant element of comprehensive care.

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