Guillain-Barré syndrome, about a disease that is a challenge for doctors of various specialties

Zespół Guillain-Barré, czyli o chorobie będącej wyzwaniem dla lekarzy różnych specjalności

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Abstract
Although the Guillain-Barré syndrome is relatively rare, it is a disease entity that doctors of different specialties and physiotherapists should know as much as possible. It is a post-infectious autoimmune polyneuropathy. This condition afflicts patients unexpectedly and in a short time may lead to damage to many organs and even become life-threatening. Due to the multitude and variety of symptoms, treatment of the Guillain-Barré syndrome requires more close co-operation of the entire therapeutic team than other diseases. A physiotherapist plays a special role when working with the patient with the Guillain-Barré syndrome. Restoring lost or limited functions requires time, patience, knowledge and experience to select the methods for working with the patient in the most effective way.

Keywords: Guillain-Barré syndrome, treatment, rehabilitation

The Guillain-Barré syndrome (GBS) is a relatively rare condition. Between 0.75 and 2 adults per a population of 100 000 people are afflicted with this disease every year. This syndrome belongs to the group of polyneuropathy, polyneuritis of autoimmune origin, in which demyelination of the peripheral nervous system occurs. The main symptom of the disease is paresis or flaccid paralysis which first affects the limbs. Respiratory and sensory disorders usually appear [1, 2]. The Guillain-Barré syndrome is usually preceded by infection of the upper respiratory tract or gastrointestinal tract, sometimes surgery or immunisation. The first case reports of this disease date to 1916 and relate to two French soldiers who were diagnosed with muscle aches, parasthesia and weakening of muscular strength. In 1927, two authors were finally acknowledged for their detailed description of the symptoms of the disease [3]. This disease can appear in the course of cancer, lymphoma, sarcoidosis, lupus, Hodgkin's disease, HIV infection or Lyme disease. It is believed that the symptoms are usually reversible, but for many patients the disease is life-threatening due to the possibility of breathing disorders. It is assumed that GBS may occur at any age. It usually appears after a gastrointestinal or respiratory tract infection [4].

The risk factor for the disease is an infection: *Campylobacter jejuni*, cytomegalovirus, *Epstein-Barr virus* (EBV), *Mycoplasma pneumoniae* protozoan, *Haemophilus influenzae,* herpes virus, influenza A and B, parainfluenza, chickenpox. A few weeks after suffering the infections described above, there following occur: myalgia and bilateral symmetrical paralysis or muscular paresis. Paresis from its first symptoms to its full severity may increase within 12 hours to 4 weeks. In this phase of the disease, tendon reflexes weaken or become suppressed, paresthesia appears and increases, i.e. unpleasant sensation, usually tingling and numbness, or the sensation of a change in skin temperature. Over the next 2 weeks, stabilisation time is observed. After this phase, the movement deficit begins to disappear. This process takes up to several months [5, 6].

In most patients in the initial stage of the disease, the decrease in muscle strength affects the lower limbs, a little later it affects the muscles of the upper limb, and at the very end – the torso. These processes may be accompanied by paresis of cranial nerves, in particular facial nerves, which usually is unilateral [3]. Patients may also have asymmetrical damage to the abducens nerve. As a result of paresis of the bulbous nerves, speech and swallowing disorders may occur [7]. Swallowing disorders are observed in a significant percentage of patients with GBS, 20% of patients have paraesthesia around the mouth, tongue and jaw, and weak rumen muscles due to trigeminal nerve dysfunction. As a result of the decrease in the strength of the torso muscles, there may be respiratory disorders that affect ¼ of patients. In the course of GBS, both exteroceptive and deep sensation

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may be damaged. Movement symptoms may be preceded by paresthesia of the feet and hands [8]. Patients also observe disorders of the functioning of the autonomic nervous system, manifested by irregularities in heart rhythm, intestinal peristalsis, fluctuations in blood pressure and urinary retention. Anxiety, hallucinations, depression, psychomotor agitation or psychotic symptoms may be observed in the acute phase of the disease. The less common symptoms of the syndrome include: swelling of the optic disc, myokimie (involuntary, slow wave of muscle spasm visible under the skin, engaging single fibers or muscle groups), meningeal symptoms or headache [2].

One of the GBS subtypes with the most clinically severe course is the so-called Miller-Fisher syndrome manifested by ataxia (lack of voluntary coordination of movement), ophthalmoplegia (inability to move the eyes from side to side and ptosis – drooping of the eyelids), as well as the suppression of reflexes. Signs of cranial nerve involvement may occur, including facial paresis and bulbous symptoms, as well as cardiovascular disorders and respiratory failure [9].

Diagnosis of GBS is based on a thorough neurological examination, but above all on the analysis of the results of many additional tests, the most important of which is the analysis of cerebrospinal fluid (CSF). CSF is taken from a lumbar puncture. The presence of GBS is proven by an increase in protein concentration, which often lasts for several months and even up to several hundred mg/dl, with slight pleocytosis (number of cellular elements). It may also be accompanied by an increase in the concentration of oligoclonal IgG fraction. Blood tests show increased ESR, low leukocytosis, lymphocytosis, and increased levels of IgA, IgG and IgM immunoglobulins. Antibodies against galactocerebrosides and myelin appear, as well as myelin combined with glycoprotein. Another test helpful in making a diagnosis is electroneurography (ENG), which shows: extension of end latency and F wave or lack thereof, conduction disorders of sensory fibres and motor nerves – as well as multifocal conduction block present in nerves. The motor response has low amplitude. These changes are noticeable after a few or several days from the appearance of the first symptoms of the disease. For diagnostic purposes, a cardiac ECG is also performed, in which, in the case of GBS, flattening of the T wave is observed, as well as an increase in the QRS wave and sinus tachycardia. Electromyography (EMG) is an important test in which fibrillation is visible in the axonal form of GBS, and later reinnervation occurs. Performing a peripheral nerve biopsy shows segmental demyelination, inflammatory infiltrations and frequent axonal damage, which is described on the basis of a neurohistopathological examination [10].

The pathogenesis of GBS is very complex. Peripheral nerve damage is caused by the immune system's response to the infection. This happens either through cellular or humoral responses. In the first case, T lymphocytes activate the transport of macrophages towards the affected nerve and through their connection with antigens on the surface of Schwann cells, the myelin sheath is damaged in the nerves. In the second case, B lymphocytes begin the production of antibodies that attach to the surface of Schwann cells and neurons, which leads to the activation of the complement system and neuronal damage [3]. The nerve conduction is delayed due to incorrect cell polarisation, preceded by a combination of antibodies with neuron antigens in nodes of Ranvier. An important phenomenon in the discussed pathomechanism of GBS is molecular mimicry. The similarity between the structures of one's own nervous system and the antigen of the infectious agent leads to directing the activity of the stimulated immune system through a previous infection against one's own nervous tissue. Lipooligosaccharides are present on the surface of the microbial cell membranes that cause the infection that precedes the onset of GBS, which „resemble" gangliosides. These, however, are found in nerve cells and Schwann cells and the body activates destructive mechanisms against them [11].

Nowadays medicine reaches for two basic methods of treatment of GBS, which have replaced inefficient steroids, azathioprine or cyclophosphamide. The first is the intravenous administration of immunoglobulins (0.4 g/kg/day) for 5 days. The duration of treatment can be shortened to 2–3 days and a higher dose of immunoglobulin may be administered, even 1.0 g/kg/day. When choosing this method of treatment, one should be aware of the undesirable effects of immunoglobulins in the form of pain in the limbs, head, chest, fever, nausea, rashes, and tingling. In addition, its side effects may include other life-threatening complications: kidney failure, heart failure, stroke, heart attack, hepatitis, brain inflammation or hemolytic anaemia – which are a consequence of an allergic reaction. The second therapeutic option is plasmapheresis (TPE – *therapeutic plasma exchange).* It is a procedure involving the exchange of 3 to 3.5 litres of plasma, which is carried out 3–5 times for 7 to 14 days. Plasmapheresis is most often performed in dialysis centres or intensive care units under the supervision of a nephrologist or an intensive care specialist. Plasmapheresis also carries a risk of side effects associated with an allergic reaction to plasma: pressure fluctuations, arrhythmias, infections, venous thromboembolism, pulmonary embolism or the risk of TRALI syndrome – *transfusion-related acute lung injury*) involving acute, non-cardiogenic pulmonary edema. However, they are relatively rare, and most nephrologists consider the procedure to be safe [11].

The methods described above are used in the first 2 weeks of the disease, when its symptoms begin to worsen. They shorten its acute phase, but cannot ensure removal of the resulting motor dysfunction. Immunomodulatory treatment is used for signs of respiratory failure and for rapid progression of the disease. Both plasma exchange and intravenous immunoglobulin administration have similar efficacy, especially in adults. In children, the effect of early treatment of GBS with plasmapheresis is very

good and allows to shorten the rehabilitation phase, often to 6–8 weeks.

In severe cases combined with symptoms of multiple organ failure, one cannot exclude a situation in which the patient with GBS must be placed in an intensive care unit where his/her vital signs are monitored: arterial pressure, heart function, bulbous symptoms, breathing. Hospitalisation with access to the intensive care unit is necessary in the acute phase of the disease until the patient's clinical condition becomes normal. Often, patients require mechanical ventilation, feeding with a nasogastric tube, as well as cardiac resynchronization therapy or therapy for arterial hypertension [3, 10].

Undoubtedly, care and rehabilitation is an important element of treatment at every stage of the Guillain-Barré disease. Physiotherapy and rehabilitation procedures in the case of patients with GBS usually includes the following forms of therapy:

- neuromuscular re-education exercises according to the PNF (*Prorioceptive Neuromuscular Facilitation*) method and the NDT-Bobath (*Neuro Developmental Treatment*) method,
- exercises in water,
- neuromuscular electrical stimulation,
- massage,
- hydrotherapy,
- hippotherapy,
- activity-based therapy,
- orthopaedic supplies.

The goal of kinesitherapy based on the physiotherapeutic method of proprioceptive neuromuscular facilitation (PNF) is to work on lost or limited motor functions [12]. Stimulating unused potentials allows the highest possible functional level to be achieved thanks to the integration of motion teaching and motor control principles. In terms of functional activities, the ones that are the most important to patients, which enable them to function independently, are always taken into account. The aim of rehabilitation according to the PNF method is for the patient to perform these activities on his/her own, while preparing him/her for situations that will take into account the future conditions in which he/she will function. The global movements performed are analogous to the natural work of muscles, with rotation being their basis and plane of movement being inclined. Therapists gradually strive to increase the dosed manual resistance, which allows for practising coordinated movements within a certain range. Using the PNF method, one should pay attention to muscle synergisms, which result in stimulation of weaker muscle groups. In order to increase the intensity of rehabilitation, elements of the NDT-Bobath method for adults should be introduced into therapy, using selective movements, ergonomics and the economy of patient movements by minimizing energy consumption during an uncompensated movement [13]. When exercising according to the PNF and NDT-Bobath methods, individual approach to the patient resulting from motor limitations is considered to be a rule. In more severe forms of BGS, the physiotherapist's manual impact on the person performing exercises may include several elements, including controlling pelvic, hip, head, shoulder joint, holding or maintaining and controlling posture and movement if the patient is unable to complete a task on his/her own as well as assisting the patient in starting the intended movement and stretch of contracted muscles to increase the range of motion.

The programme of rehabilitation of patients with GBS should include water treatments – vortex massages of both lower limbs and upper limbs. They improve muscle tension and blood supply to muscles affected by paresis. In addition, they are an important element of preparation for exercises. An integral part of kinesitherapy and physical therapy for patients is a daily classical massage lasting several minutes, especially of the back muscles, shoulder girdles and lower limb muscles. Massage affects the regularity of metabolic processes in all components of the nervous system, and also stimulates nerve conduction. It also prevents muscle atrophy and should be dosed according to the patient's current reactivity and state of health [14].

Hippotherapy is used to strengthen muscles, prevent contractures and correct body posture [15]. Hippotherapy in patients with GBS may also be one of the first elements of gait re-education, thanks to the three-dimensional movements of the horse's back. Activities should be tailored to the needs and capabilities of patients during recovery. During this time, one may also offer activity-based therapy to patients, considering it one of the forms of activity for people with nervous system dysfunctions, but also a therapeutic way of spending free time. Activity-based therapy should be modified depending on individual progress, which is manifested in the improvement of manual dexterity of the hand as well as the precision of performed activities.

In many patients with more severe forms of GBS, orthopaedic equipment accelerates rehabilitation and is an important mechanical aid. It helps patients in locomotion and gait re-education. At the initial stage of the disease, the movement is facilitated by an ACTIVE type wheelchair (active wheelchair), which is different due to a light and durable material from which it was built, as well as a light and rigid structure. Mobility and movement can also be facilitated by a walker, and later elbow crutches and KAFO (*knee-ankle-foot-orthosis*) type lower limb braces stabilizing the knee and ankle joints, supporting the correct positioning of the limb during gait training and affecting its efficiency [16]. Independent mobility remains a challenge for patients. This is a difficult task due to the reduced muscle strength, especially in the lower limbs. The way the limbs return to full fitness is the same as the way the first symptoms appeared.

Rehabilitation activities and physiotherapy are teamwork. The key task of the rehabilitation team is to personalise the rehabilitation programme for patients, which, in addition to pa-

tients' patience and cooperation, is a chance for them to regain full mobility. The quality of life of patients with GBS is influenced by their individual approach to the consequences of the disease, personality type as well as age, education, economic or social status. The quality of life assessment changes over time and is most often associated with an improvement in the neurological and functional state. For young people who have been healthy so far, getting the Guillain-Barré syndrome is always a surprise. The rarity of this disease, the unknown aetiology, often severe course raises many questions, especially the most important: – Will I return to the state before the appearance of this generally unknown disease? There is no doubt that every patient with GBS has a difficult recovery period and undergoes intensive rehabilitation during which the patient sets new life goals. Their implementation is possible thanks to the support in the form of psychological help or motivation by loved ones. These factors are often crucial for recovery.

There is also one more important point of action in the recovery of every patient with GBS worth mentioning, i.e. the reduction of the patient's subjective feelings, such as the reduction of pain, fatigue, exclusion and depression, which may affect his/her decisions or approach to work performed. The consequence of the disease is its negative impact on various spheres of life: social activity, spending free time, commence occupational work, looking after others. Certainly, the patients themselves and the people who accompany them in the fight against the disease must strive to reduce them and then eliminate them. Rehabilitation and selection of appropriate physiotherapeutic methods and their individualisation enable functional improvement and improve the quality of life, while patient's patience and cooperation are an opportunity for him/her to regain full mobility.

The Guillain-Barr**é** syndrome still remains a challenge for doctors of various specialties, including a neurologist, nephrologist, and intensive care specialist – but also a physiotherapist, psychologist or activity therapist. It is worth remembering this despite the fact that the disease is rare as its course can be very severe. Paediatric experiences with early onset of TPE and subsequent rehabilitation are good, and neurorehabilitation is usually not necessary. Children usually do not require respiratory therapy, and recover on average around 6–12 weeks after the first symptoms of a single-phase disease appear [17]. In adult patients in whom GBS occurs in the form of the aforementioned Miller-Fischer syndrome, characterised by a triad of symptoms in the form of external ophthalmoplegia, lack of voluntary coordination of movement (ataxia of the ichodium limbs) and areflexia, with additional symptoms – such as dysphagia and dysautonomia – the prognosis can be more serious and return to health incomplete, despite many months of rehabilitation [18, 19].

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Streszczenie

Chociaż zespół Guillain-Barré występuje stosunkowo rzadko, jest jednostką chorobową, o której lekarze różnych specjalności oraz fizjoterapeuci powinni wiedzieć jak najwięcej. To poinfekcyjna polineuropatia o charakterze autoimmunologicznym. Schorzenie to spada na pacjenta niespodziewanie i w krótkim czasie może doprowadzić do uszkodzenia wielu narządów, a nawet spowodować zagrożenie życia. Ze względu na mnogość i różnorodność objawów, leczenie zespołu Guillan-Barré, bardziej niż innej choroby, wymaga ścisłej współpracy całego zespołu terapeutycznego. Szczególną rolę w pracy z pacjentem z zespołem Guillain-Barré pełni fizjoterapeuta. Przywrócenie utraconych lub ograniczonych funkcji wymaga czasu, cierpliwości, wiedzy i doświadczenia, by jak najskuteczniej dobrać metody pracy z pacjentem.

Słowa kluczowe: zespół Guillain-Barré, leczenie, rehabilitacja