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DOI: 10.15225/PNN.2025.14.3.5 JNNN 2025;14(3):131–135 **Review**

Patient with Neurogenic Bladder Dysfunction after Stroke in the Neurological Rehabilitation Ward

Pacjent z neurogenną dysfunkcją pęcherza moczowego po udarze mózgu w oddziale rehabilitacji neurologicznej

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Abstract

Strokes cause disability or severe disability. A common complication being a direct result of stroke is neurogenic bladder dysfunction. Urinary incontinence and chronic urinary tract infections adversely affect the patient's health and delay the process of neurological rehabilitation. The aim of this paper is to discuss urological problems occurring after stroke and the appropriate nursing and rehabilitation procedures for patients with neurogenic bladder dysfunction. A literature review was conducted for the following key words: stroke, neurogenic bladder, nursing care. Scopous, Ebsco PubMed and Google Scholar databases were searched. 25 articles were finally included in the detailed analysis. It has been shown that functional dysfunction of the urinary bladder and urethra is a serious complaint of a patient after a stroke. The main aim of proper nursing and rehabilitation treatment is to teach a patient complete emptying of the urinary bladder at low-pressure, reducing the discomfort resulting from urinary incontinence and preventing urinary tract infections. **(JNNN 2025;14(3):131–135)**
Key Words: neurogenic bladder, nursing care, rehabilitation, stroke

Streszczenie

Udary mózgu są przyczyną inwalidztwa bądź ciężkiej niepełnosprawności. Częstym powikłaniem będącym bezpośrednim skutkiem udaru jest neurogenna dysfunkcja pęcherza moczowego. Nietrzymanie moczu oraz przewlekle infekcje dróg moczowych wpływają niekorzystnie na stan zdrowia chorego oraz opóźniają proces rehabilitacji neurologicznej. Celem pracy jest omówienie problemów urologicznych występujących po udarze mózgu oraz właściwego postępowania pielęgniarskiego i rehabilitacyjnego wobec pacjenta z neurogenną dysfunkcją pęcherza moczowego. Dokonano przeglądu piśmiennictwa, z użyciem słów kluczowych: udar mózgu, pęcherz neurogenny, opieka pielęgniarska. Przeszukano bazy Scopous, EbscoPubMed i Google Scholar. Ostatecznie do szczegółowej analizy włączono 25 artykułów. Wykazano, iż dysfunkcja czynnościowa pęcherza moczowego i cewki moczowej jest poważną dolegliwością pacjenta po udarze mózgu. Zasadniczym celem właściwego postępowania pielęgniarskiego i rehabilitacyjnego jest nauka całkowitego opróżniania pęcherza moczowego w sposób niskociśnieniowy, zmniejszenie uciążliwości wynikających z nietrzymania moczu oraz zapobieganie infekcjom dróg moczowych. **(PNN 2025;14(3):131–135)**
Słowa kluczowe: pęcherz neurogenny, opieka pielęgniarska, rehabilitacja, udar mózgu

Introduction

Strokes have been a growing problem in an ageing society and a major cause of disability or severe disability of patients. It results in huge expenditure on health care, the need for constant care and lost earning capacity of a person. It is estimated that 25–50% of stroke patients are disabled, which means permanent or partial dependence on third persons. The chances of survival of a stroke patient depend on the time when a patient is provided

with first aid. Ideally, patients showing the first symptoms of a stroke should be immediately referred to a stroke ward to reduce ischemia in the stroke-affected area with cerebral perfusion therapy [1]. One of the complications resulting from a stroke, when the canals or centers responsible for controlling micturition are damaged, may be neurogenic bladder dysfunction. It is necessary to properly diagnose and treat such a patient to protect them from the negative effects of this neurogenic dysfunction. Every patient after a stroke should have the chance for early post-stroke rehabilitation, aimed at improving and restoring the lost functions, if possible. There have been scientific reports that Covid-19 significantly increases the risk of thromboembolic complications. Coronavirus infection causes deregulation of the coagulation system and promotes the development of such complications as stroke, pulmonary embolism and deep vein thrombosis of the lower limbs [2]. Therefore, it seems important to address the issue of problems related to neurogenic bladder resulting from stroke.

The aim of this paper is to discuss urological problems occurring after stroke and the appropriate nursing and rehabilitation procedures for patients with neurogenic bladder.

Development of Neurogenic Bladder Dysfunction

Patients after a stroke very often report urological problems in the early phase, it is estimated that this applies to about 57–83% of all patients [3]. The emerging urological complications depend on the location of the brain damage and are related to neurogenic urinary tract dysfunctions. The occurring problems may concern bladder and urethra dysfunctions, which is a common functional unit, referred to as the neurogenic bladder [4]. Neurogenic bladder is a symptom of damage to the nerve centers or canals responsible for micturition. Micturition is done by coordinated actions of the detrusor muscle of the urinary bladder with the internal and external urethral sphincter. During micturition, the detrusor contracts and the sphincters relax, while in the urine storage phase, the detrusor is relaxed, and the sphincters are tightened [5]. When the bladder is full, a signal is sent to the brain to urinate. The frontal lobe, the superior-medial part, and the corpus callosum have centers responsible for any detrusor function. If conditions make it impossible to urinate, the frontal lobe inhibits micturition. If the bladder is maximally stretched, despite the control of the frontal lobes, it will empty spontaneously as a defense mechanism that prevents kidney damage [3,6].

Medersbacher developed a classification of neurogenic vesicourethral dysfunction and distinguished four types of neurogenic bladder pathology: detrusor and sphincter overactivity, detrusor hyporeflexia or areflexia with sphincter overactivity, detrusor and sphincter underactivity, and detrusor overactivity with sphincter incompetence [6]. During detrusor and sphincter overactivity, the detrusor and external urethral sphincter contract. This type of dysfunction generates symptoms such as increased pressure in the urinary bladder, frequent urination in small amounts and difficulty in emptying the bladder completely. These symptoms may also include retention of a large amount of urine, vesicoureteral reflux and, in the advanced stage of the disease, thickening of the walls of the urinary bladder. The above symptoms increase the pressure in the upper urinary tract, which may eventually lead to kidney failure.

In the second type of dysfunction, which is detrusor hyporeflexia or areflexia with sphincter hyperfunction, there is often a complete retention of urine in the bladder. Then, there may be a lot of residual urine, excessive stretching of the bladder walls and leakage of urine due to overflow.

If detrusor and sphincter are weakened, there is urinary incontinence, inability to completely empty the bladder or constant leakage of urine from the bladder will occur. The dysfunction of an overactive detrusor with an inefficient sphincter may be followed by increased urgency with urinary incontinence, frequent urination and inability to completely fill the bladder [4,7–9].

Diagnosis of Neurogenic Bladder

In the prevention of complications of bladder and urethra dysfunction, it is necessary to systematically monitor their function. A general urine test is of the highest importance in the diagnosis of these disorders, the test is inexpensive and easy to perform. It allows to detect symptoms of urinary tract infection during urinary tract infection, also when there are no dysuria symptoms and the patient's neurological condition is deteriorating, e.g. when the muscle spasticity is increasing. If there is an infection, a urine culture will be an additional diagnose, allowing to determine the type of pathogen and to apply targeted antibiotic therapy [10].

The best, non-invasive way to assess the bladder is to perform an ultrasound examination. It assesses the bladder through the abdominal walls for the presence of diverticula, urinary stones, tumors and the amount of residual urine [11]. The assessment of the amount of residual urine after micturition can also be determined during CIC (clean intermittent catheterisation). CIC is not only a diagnostic method, but it is the gold standard

in the treatment of neurogenic bladder, recommended because of the lowest rate of complications [12,13].

The basic test to determine the type of bladder and urethra dysfunction is a urodynamic test [14]. It is performed to measure pressure in the bladder and to assess the pressure values during urination. The test involves placing catheters with pressure transducers in the bladder and rectum, which record the change in pressure in the bladder and abdominal cavity. During the test, the amount and speed of urine released and PVR are determined, it is the volume of residual urine after micturition. It is less than 40 ml in children, less than 100 ml in adults and amounts to 25% of the initial bladder capacity. It is highly important to provide the patient with a sense of security and privacy during the test [15].

Nursing and Rehabilitation Procedures

The type of neurogenic bladder dysfunction that occurs depends on the location of damage to the nervous system. This problem most often occurs due to damage to the structures responsible for micturition, especially the centers located in the frontal lobe and the pons. Immediately after a stroke, most often in the first 72 hours, urinary retention may occur due to immobilization. If urinary retention occurs later, the cause may be the sudden removal of a catheter that has been applied for a long time or detrusor sphincter dyssynergia. This situation will require emptying the bladder by catheterization, e.g. intermittent catheterization. CIC allows for emptying the bladder at a low-pressure, while maintaining the function. It is the treatment of choice, much safer, allowing to avoid urinary tract infections, compared to a permanent Foley catheter [16]. The frequency of catheterization depends on the capacity of the bladder and the amount of fluid taken. The optimal size of the Nelaton catheter is 12–14 Fr. It is recommended that CIC resembles natural micturition and is performed at least 4–6 times a day. Less frequent catheterization (1–3) times a day contradicts the idea of self-catheterization and is indicated in the case of a patient with a neurogenic bladder to assess residual urine after micturition. Unfortunately, the CIC method is not very popular among patients due to insufficient education and the need for repeated, clean catheterization. The most common complications of this method include urinary tract infection, bleeding and changes in the urethra [8]. Unfortunately, patients most often prefer a permanent Foley catheter, with urine draining into a bag. Leaving such a catheter in the bladder prevents it from shrinking and can lead to fibrosis of the bladder walls and even cirrhosis. Additionally, the Foley catheter is a constant source of infection, causing bacterial colonization in the bladder, which can consequently cause urinary tract infection and even kidney damage [12]. Many studies suggest that Foley catheter removal should be attempted as soon as possible, and routine insertion should be avoided. If the patient requires prolonged Foley catheter use, the suprapubic catheter may be the method of choice [17].

After a stroke, overflow incontinence and bladder hyperreflexia can also be diagnosed. Detrusor hyperreflexia is most often caused by excessive contractile activity and reduced functional capacity of the bladder. It results in increased urgency, frequent urination and the inability to completely fill the bladder [11,18].

According to many studies, urinary incontinence is still a serious problem for a large group of stroke patients, affecting their quality of life and emotional state [19]. Urinary incontinence is an embarrassing problem, which causes additional discomfort due to recurrent infections of the lower urinary tract. The patient's helplessness due to the troublesome condition is often the cause of depression, which can also occur after a stroke. Then, it is important to provide the patient with professional nursing care. It is important to ensure intimate hygiene and prevent the development of intertrigo and pressure sores. The use of diaper pants or urological pads will be helpful in maintaining proper perineal hygiene. An external catheter, the so-called uridon, is also a good solution for men. It is easy to use and significantly reduces the risk of urinary tract infections if such catheter is replaced regularly. An external catheter for men is a much less invasive and safe solution to use, compared to a Foley catheter. It is estimated that 80% of urinary tract infections are caused by the placement of a Foley catheter permanently [20–22]. The occurrence of a urological infection has an adverse effect on the patient's health, may cause increased spasticity and contributes to a significant delay in the rehabilitation process.

It will be important to encourage the patient to perform pelvic floor exercises in the care of a patient with urinary incontinence. Exercises to strengthen the pelvic floor muscles — so-called Kegel exercises are a safe method, involving consciously tensing and relaxing the pelvic floor muscles to strengthen the muscles of the external urethral sphincter. The best effects are achieved by the patient performing the exercises 2–3 times a day for 8–10 minutes. After 4–8 weeks of regular exercises, a noticeable improvement in the strength of the contraction of the tensed muscles was noted [23].

An important role in the nursing care of a patient with a neurogenic bladder is the re-education of behaviors related to micturition. The use of behavioral therapy involves training the urinary bladder by using three-hour breaks between micturition during the day and maintaining a break at night. Learning to urinate at the appropriate time is aimed at imitating regular micturition

and developing the habit of going to the toilet before the bladder empties spontaneously. A patient can be advised to use a micturition diary to reduce urgency and better control of micturition. It is recommended to document the time and course of micturition, including the frequency and volume of micturition, the occurrence of a feeling of incomplete emptying of the bladder and possible symptoms of urinary tract infection. It is also necessary to ensure frequent fluid intake, preferably in small amounts, and to limit caffeine consumption.

The above actions in the care of a patient with neurogenic bladder dysfunction will be supplemented by physical therapy. The use of electrostimulation in the treatment of a patient with a neurogenic bladder is very effective and popular. This method involves irritating the nerve endings in the skin and causing muscle contraction with impulse current. It improves blood circulation, supports the regenerative processes of nerves and muscles, and stimulates the micturition centers [7,18].

Good effects are also achieved by using the so-called pulsating magnetic field, which acts directly on the motor fibers of the visceral and pudendal nerves. The muscles subjected to the magnetic field contract, thus providing an effective improvement of the symptoms in a short time. The pulsating magnetic field can be performed directly through the patient's clothing [24].

In recent years, injections of botulinum toxin type A into the bladder neck have been used to treat neurogenic bladder with detrusor overactivity. This method is an effective alternative to treating urinary incontinence, with a single injection of the toxin allowing for symptom relief for a period of 6 to 9 months [25].

Summary

Early neurological rehabilitation is an important step in the treatment of stroke patients. It aims to reduce the degree of disability by improving physical fitness and mental condition, and thus improving the quality of life of patients. A common complication occurring in stroke patients is neurogenic bladder dysfunction. This problem requires rapid diagnosis, effective treatment, and appropriate nursing and rehabilitation procedures. The patient should be educated in bladder training and clean intermittent catheterization. The presented procedures are intended to prevent urinary tract infections, improve urinary tract function and the patient's quality of life.

Implications for Nursing Practice

Early neurological rehabilitation is an important step in the treatment of stroke patients. A common complication in stroke patients is neurogenic bladder dysfunction, which must be diagnosed promptly to ensure effective treatment, rehabilitation and appropriate nursing care. The aim of the joint actions undertaken is to improve the function of the urinary tract and prevent urinary tract infections. The assessment of the condition of the urinary tract and bladder function should be performed regularly. Clean intermittent catheterization is the recommended nursing procedure in patients with neurogenic bladder, for its low rate of complications. CIC should resemble natural micturition and should be performed at least 4–6 times daily. It is recommended to avoid routine Foley catheterization. It should be removed as soon as possible in patients with such catheters. An external catheter is a more convenient and safer alternative for men with incontinence. The priority of nursing care in the neurological rehabilitation ward is to restore the functions lost by the patient because of stroke, or to compensate for loss of such functions.

References

[1] Piskorz J., Wójcik G., Iłzecka J., Kozak-Putowska D. Wczesna rehabilitacja pacjentów po udarze niedokrwiennym mózgu. *Med Og Nauk Zdr*. 2014;20(4):351–355.

[2] Markus H.S., Brainin M. COVID-19 and stroke-A global World Stroke Organization perspective. *Int J Stroke*. 2020;15(4):361–364.

[3] Lipowski M., Kucharska-Lipowska M., Brola W. Powikłania urologiczne po udarze mózgu. *Aktualn Neurol*. 2019;19(3):125–131.

[4] Leslie S.W., Tadi P., Tayyeb M. *Neurogenic Bladder and Neurogenic Lower Urinary Tract Dysfunction* (updated July 4, 2023). Retrieved November 5, 2024, from https://www.ncbi.nlm.nih.gov/books/NBK560617/.

[5] Dorsher P.T., McIntosh P.M. Neurogenic bladder. *Adv Urol*. 2012;2012:816274.

[6] Panicker J.N., Fowler C.J., Kessler T.M. Lower urinary tract dysfunction in the neurological patient: clinical assessment and management. *Lancet Neurol*. 2015;14(7):720–732.

[7] Hojan K., Tymińska A., Kurnatowski J., Piotrowska B. Fizjoterapia w terapii pęcherza neurogennego. *Prakt Fizjoter Rehabil*. 2015;65:6–16.

[8] Zajda J. Pacjent z neurogenną dysfunkcją pęcherza. Praktyka ambulatoryjna. *Prz Urol*. 2012;1(71):15–18.

[9] Zaborski J. Pęcherz neurogenny. *Neurol Prakt*. 2018;2:9–14.

[10] Duanngai K., Sirasaporn P., Ngaosinchai S.S. The reliability and validity of using the urine dipstick test by patient self-assessment for urinary tract infection screening in spinal cord injury patients. *J Family Med Prim Care*. 2017;6(3):578–582.

[11] Granier P., Audry P., Coste B., Fleys E., Trives M., Szczot A. Place d'un échographe vésical portable dans la prise en charge des troubles de la vidange vésicale après accident vasculaire cerebral. *Ann Readapt Med Phys*. 2002;45(4):166–172.

[12] National Clinical Guideline Centre (UK). *Urinary Incontinence in Neurological Disease: Management of Lower Urinary Tract Dysfunction in Neurological Disease*. Royal College of Physicians (UK), London 2012.
[13] Panicker J.N. Neurogenic Bladder: Epidemiology, Diagnosis, and Management. *Semin Neurol*. 2020;40(5): 569–579.
[14] Ginsberg D.A., Boone T.B., Cameron A.P. et al. The AUA/SUFU Guideline on Adult Neurogenic Lower Urinary Tract Dysfunction: Diagnosis and Evaluation. *J Urol*. 2021;206(5):1097–1105.
[15] Joshi A.D., Shukla A., Chawathe V., Gaur A.K. Clean intermittent catheterization in long-term management of neurogenic bladder in spinal cord injury: Patient perspective and experiences. *Int J Urol*. 2022;29(4):317 –323.
[16] Jeong S.J., Oh S.J. Recent Updates in Urinary Catheter Products for the Neurogenic Bladder Patients with Spinal Cord Injury. *Korean J Neurotrauma*. 2019;15(2):77–87.
[17] Jin X., Tang H., Yuan H., Chen G. Case report: Sacral neuromodulation for neurogenic lower urinary tract dysfunction in patient with neuronal intranuclear inclusion disease. *Heliyon*. 2024;10(12):e32374.
[18] Fiodorenko-Dumas Ż., Paprocka-Borowicz M. Postępowanie fizjoterapeutyczne w nietrzymaniu moczu. *Med Og Nauk Zdr*. 2014;20(1):12–16.
[19] Szwedowski M., Szwedowska E. Przydatność badań urodynamicznych w diagnostyce i leczeniu nietrzymania moczu u kobiet. *Przegląd Urologiczny*. 2014;4(86):28–33.
[20] Foley N., Wiener J., Cotoi A. et al. Chapter 17: Medical Complications Post Stroke. In Evidence-Based Review of Stroke Rehabilitation. Heart & Stroke Foundation, 2018.
[21] Wang P., Shi J., Zhao L. et al. The efficacy and safety of electroacupuncture against urinary incontinence after stroke: A protocol for systematic review and meta analysis. *Medicine (Baltimore)*. 2020;99(38):e22275.
[22] Socha M., Kozioł-Montewka M., Pańczuk A. Zakażenie dróg moczowych u chorych po udarze mózgu — współzależność z procesem rehabilitacji, zapobieganie. *Med Og Nauk Zdr*. 2017;23(4):221–224.
[23] Poisson S.N., Johnston S.C., Josephson S.A. Urinary tract infections complicating stroke: mechanisms, consequences, and possible solutions. *Stroke*. 2010;41(4):e180–184.
[24] Gözlersüzer Ö., Yalvaç B., Çakıroğlu B. Investigation of the effectiveness of magnetic field therapy in women with urinary incontinence: Literature review. *Urologia*. 2023;90(1):51–57.
[25] Hsieh P.F., Chiu H.C., Chen K.C., Chang C.H., Chou E.C. Botulinum toxin A for the Treatment of Overactive Bladder. *Toxins (Basel)*. 2016;8(3):59.

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