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Review article

Care of Patients with Parkinson's Disease after Deep Brain Stimulation: The Role of Nursing Staff

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Abstract

Parkinson's disease is a chronic neurodegenerative disease caused by the progressive destruction and demise of neurons that produce the neurotransmitter dopamine, and causes motor disorders: muscle rigidity, hypokinesia, rest tremor, postural instability.

In this article, the authors consider the issues of postoperative care of patients with Parkinson's disease who underwent surgery for implantation of a neurostimulator for deep brain stimulation. The role of nursing staff in improving the quality of life of patients, in the prevention of complications and participation in the provision of medical and rehabilitation care in the postoperative period is assessed.

Keywords: postoperative care, nursing care, Parkinson's disease, deep brain stimulation, neurorehabilitation, rehabilitation.

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Introduction

Parkinson's disease (PD) is a chronic neurodegenerative disease caused by the progressive destruction and demise of neurons that produce the neurotransmitter dopamine, and causes motor disorders: muscle rigidity, hypokinesia, rest tremor, postural instability [1-3].

Non-motor manifestations are also characteristic: pain, paresthesia, sensory abnormalities, autonomic dysfunction, behavioral and sleep disorders. Although levodopa is the gold standard in the later stages of the disease, over the years, most patients suffer from developed motor fluctuations leading to disability, dyskinesia and non-motor complications that are difficult to cope with, and pharmacoresistance may also develop [1].

Methodology

Articles were studied using the following databases of scientific publications and specialized search engines in depth over the past 20 years: PubMed, Scopus, Web of Science, Google Scholar. Inclusion

Deep brain stimulation of patients

Deep Brain Stimulation (DBS) involves surgically implanting needle electrodes connected to an implantable impulse generator into specific areas of the brain to reduce the symptoms of PD, such as: tremor, slowness, stiffness and walking problems. DBS is especially indicated when the reaction to the drug worsens, periods of "shutdown" worsen, the patient develops unbearable drug-induced dyskinesia with refractory motor fluctuations or tremor, there is no significant improvement in relation to dopaminergic drugs (<30%), and only moderate improvement is noticeable during the "on" state [2].

Postoperative care begins with a prevention plan for many complications that may arise due to DBS. Short-term complications may include weight gain, dyskinesia, speech dysfunction, muscle contractions, visual disturbances, changes in eyelid movement, muscle contractions, as well as behavioral and cognitive problems. Medical care should also be prescribed for effective relief of postoperative pain. Long-term complications may include erosion, loss of DBS effect, and intermittent stimulation. A nurse should be aware of possible soreness in the head, neck and chest area. There may be swelling around the eyes for several days after surgery [2].

The medical team should be trained in dressing the incision site and preventing local adverse events, ensuring proper hygiene and protecting the skin around the incisions. In addition, they should be able to classify complications (ulcerative, proliferative, erosive and hyperemic), establish which areas of the breast are affected. It is necessary to keep the places of incisions and stitches clean and dry for at least 5 days. The area around the incisions can be gently washed after 5 days. If there is a surgical bandage, it is removed by the physician after 3-5 days [3].

During hospitalization, medical staff should inform supervising doctors about motor fluctuations and non-motor symptoms, such as pain, sleep, constipation and urination disorders. Since the implantation of electrodes can take several hours, the operating room nurse must take into account the

Therefore, neurosurgical methods of treatment have been developed, such as Deep Brain stimulation (hereinafter referred to as DBS), thalamotomy, pallidotomy [2]. The role of nursing care is very important in the postoperative period, when the patient is in a "switched off" state due to drug withdrawal, with possible postoperative complications and needs special physical and psychological support.

The purpose of this review to study the methods of care and the role of nursing staff in the management of patients with Parkinson's disease after deep brain stimulation surgery of patients.

criteria: systematic reviews, cohort and cross-sectional studies. Exclusion criteria: expert opinion in the form of short messages, advertising articles.

different needs of patients after surgery. Attention should be paid to sensations of cold or pain caused by prolonged uncomfortable position, or discomfort due to the "off" state, side effects due to stimulation, such as dyskinesia, paresthesia, diplopia, tetanic contractions.

In the postoperative period, the nurse assists the neurologist in programming the neurostimulator, evaluating the effectiveness of stimulation during hospital stay and promptly reports adverse events.

During follow-up, the nurse should carefully observe, register any problems, such as weight loss or nausea (which may indicate a displacement of the device), and report possible serious side effects to the neurologist or the team of doctors responsible for the patient [4].

Patients with DBS systems are contraindicated in diathermy (short wave therapy, microwaves, therapeutic ultrasound diathermy), which can cause damage to the neurostimulation system or tissues and lead to severe injuries [5] and even death [6].

Sources of electromagnetic interference (EMI - Electromagnetic Interference) can cause damage to the device or injury to the patient. Theft detectors and inspection devices can cause stimulation to be turned on or off, which may cause some patients to have a short-term increase in stimulation. The DBS system may be adversely affected by medical equipment such as pacemakers or therapeutic devices, cardioverters/defibrillators, external defibrillators, ultrasound equipment, electrocoagulation or radiation therapy [7].

Patients should avoid actions that may cause excessive stress on the implanted components of the neurostimulation system. Actions that include sudden, excessive or repetitive bending, twisting or stretching may cause a fracture or displacement of the component, damage to the component, displacement of the electrode, skin erosion, which may lead to loss of stimulation, intermittent stimulation or other mechanical changes that may lead to additional surgery to replace or change the position of the component.

Patients who have installed neurostimulators from Medtronic Inc. should not dive below 10 meters (33 feet) under water or enter pressure chambers with an

absolute pressure above 2.0 atmospheres, as this may damage the system of operation of the neurostimulator [8].

Patient problems that arise after deep brain stimulation and care issues

Sleep problems. One of the frequent problems of patients with PD is sleep. Patients may experience problems falling asleep, there may also be daytime drowsiness, sleep attacks, screams, bumps in their sleep, and "restless legs syndrome" (an unpleasant sensation in the legs with twitching of the legs during sleep). To improve sleep, medical staff should recommend the following actions to the patient: develop a sleep time regime, avoiding things that disrupt falling asleep and sleep (caffeine, alcohol), relaxation therapy, avoiding daytime and evening sleep. It is important for the medium-level medical personnel staff to find out all possible causes of sleep disorders for the possible need to involve other specialists, for example, the mental state of the patient – stress and anxiety can be the cause of insomnia [9].

Bathroom and toilet. It is important for medical staff and caring people to make a comfortable and safe bathroom for the patient. The main points to consider: the floor surface should be hard, non-slip, you can put rough mats; take a shower sitting down to prevent falling; reliable handrails around the bathroom; install taps with levers; have plastic containers for hygiene products; use liquid soap instead of ordinary soap; use an electric razor and brush; the toilet should be with a high seat; do not lock the doors, instead put signs "occupied", "free" [10,11].

Orthostatic hypotension. In some cases, patients with PD have orthostatic hypotension (a drop in blood pressure when moving to an upright position), leading to dizziness and frequent falls. To reduce symptoms, it is recommended: to get up slowly and gradually; to sleep with head raised position; to eat small portions and regularly; not to consume salt; to avoid a quick change of position, and long lying down; if necessary, wearing compression means or bandaging the legs (stockings) [11,12].

Freezing when walking. After the implantation of a neurostimulator, one of the frequent problems of patients is freezing – when the patient loses the ability to take a step for seconds, sometimes for minutes while walking. Most often this happens in doorways, in crowded places, etc. When freezing, the patient is unable to transfer the weight of the body from one leg to the other. In such cases, it is recommended to: stop, wait a few seconds, shift the weight of the body to the right or left (or take a step back), and take a big step forward [10- 23].

Problems with the digestive system. Patients with PD are characterized by problems from the gastrointestinal tract, such as: constipation, bloating, nausea. To reduce such side effects, the nurse may recommend diets with an increase in products such as bran fiber, whole grain products, prunes, lentils, legumes. When gastric emptying slows down, the patient is recommended to limit the consumption of sweets, fatty foods and cheese, avoiding heavy food, not sleeping immediately after eating and eating easily digestible foods. If the suggested options cannot help the patient, it is necessary to consult a doctor for taking medications or other measures [13].

In studies at the clinic in Clermont-Ferrand

(France), after 3 months, patients had an increase in body weight of 3.1 kg (in men $+3.4\pm 0.6$ kg, in women $+2.6\pm 0.8$ kg). The degree of weight gain was not correlated with the duration of the disease, the age of the patient or the preoperative equivalent dose of levodopa. If necessary, the patient and his relatives should be referred to nutrition specialists to help patients cope with the frequent weight gain that occurs after the installation of DBS [14,15].

In the postoperative period, constipation may occur, especially elderly people, with less activity, reduced gastrointestinal tract function and delayed intestinal peristalsis. One of the easiest ways to reduce the symptom is described in an article by specialists of the Hainan Public Hospital, where nurses practiced a 10-minute abdominal massage clockwise and counterclockwise [16].

Among other problems, swallowing disorders are one of the most common problems in patients with PD. Signs may be: difficulty swallowing, food getting stuck in the throat and aspiration – ingestion of food or liquid into the respiratory tract accompanying coughing. To eliminate the swallowing disorder, speech therapists, nutritionists are involved who can advise on products, tablets can be treated for swallowing, exercises and maneuvers that help avoid aspiration and increase cough [17].

Before being discharged from the hospital, the neurologist and medical staff should train patients and their family members to use the neurostimulator console, also instruct them about proper skin disinfection and timely recognition of side effects. It is extremely important that the nurse is assured that the patient or caregiver is truly trained in performing these tasks. The nurse can suggest several strategies to prevent or minimize skin reactions, such as daily change of the injection site with round-the-clock administration, compliance with the rules of asepsis and skin hygiene. Treatment of subcutaneous wounds varies depending on the type and severity of incisions [18].

After discharge, the nurse should periodically call or visit patients at home to monitor the effects of stimulation, side effects such as skin infections and erosions, refer them to the medical team, and, if necessary, invite them for repeated visits.

Mental aspects. Psychological counseling is also a necessity to help patients adjust to a greater degree of their independence from care, as well as to notify relatives caring for them to cope with their changing mental state after medication adjustment.

The nurse should evaluate the behavioral features in the hospital, since during the programming of the neurostimulator there are any unexpected thought processes or behavioral problems, because changes in certain parameters of stimulation are associated with specific changes in cognitive functions [19].

Patients with PD are characterized by a wide range of non-motor changes, such as depression, anxiety, apathy, which may increase after the implantation of a neurostimulator, which is important

for the paramedical personnel and all people involved in care to notice at the beginning of the signs.

For the effectiveness of the patient's treatment, the neurologist-parkinsonologist needs to know the time of the appearance of symptoms, the connection with taking the drug and other symptoms associated with anxiety and apathy. In such cases, the attending physician may contact a psychotherapist to conduct psychotherapy and prescribe antidepressants and anxiolytics [20].

Speech aspects. Reducing speech and oral symptoms is also one of the tasks of the DBS installation operation. With patients, speech therapists should conduct training to help the patient further reduce speech problems. The speech therapist also examines the swallowing process using a modified swallowing test to identify oral-motor problems and the risk of aspiration. If problems are detected, a modification of the diet is recommended to facilitate the handling of food and minimize the risk of aspiration [21].

After surgery, the patient may have postural instability, this can lead to a significant risk of falling, additional safety measures such as a cane, walker or wheelchair should be considered [3].

Room arrangement. One of the most important tasks for hospital staff and relatives is to ensure a safe patient environment. Since elderly patients often have disturbed sleep, they often wake up at night and take medications, read books or engage in other leisure activities. The necessary items – medicines, a bottle of water, glasses, books, watches, etc. – should lie nearby in an accessible place. In a half-asleep state, in poor lighting, there is a risk of the patient falling at night. There should be no extra items, shoes, mats, wires and other items on the way to the toilet. You can put a bed-slipper or a bed-pan next to the bed, and patients with late-stage PD can wear diapers at night if necessary. The edges of the stairs are glued with strips of luminous materials for better visibility [22,23].

Clothing for patients. Choose clothes and shoes that are easy to put on and take off. For example, front-buttoned blouses and jackets are more convenient than things worn over the head. Zippers and Velcro are easier to fasten than buttons, hooks and straps. Take enough time to get dressed [23,24].

If necessary, use auxiliary means: to fasten a button, use a special hook for buttoning buttons, similar to a large loop for threading a needle; large buttons are easier to fasten and unbutton than small ones; loose-fitting clothes made of natural fabrics, on which there are few or no fasteners at all, it is easier to remove and put on; trousers made of elastic material is also easy to slip off the feet, which makes it easier to take off clothes; attach a large ring to the zipper lock, which is easy to hold; fasteners can be replaced with Velcro; a bra with a zipper in the front is more convenient than a one that fastens at the back; when putting on shoes, use a shoe spoon with a long handle; shoes with an elastic top are easy to put on and take off; wear shoes without straps; when it's slippery outside, you need shoes with a grooved sole or with spikes [23,24].

Home shoes should be well matched to the foot, should not slip on linoleum or parquet, the heel should be low, and the back should be soft. If it is difficult for a

person to lace shoes, it is advisable to sew wide elastic bands instead of laces or make a Velcro fastener. Flip-flops without backs are not recommended as home shoes - wearing such shoes increases the risk of falling, the foot is unstable in it, flip-flops often slip off the foot [22,23].

Cognitive disorders. About 25-30% of patients are diagnosed with mild cognitive disorders at the beginning of the disease, while within 3 years 50% of patients develop neuropathological disorders and further cognitive disorders. For patients with cognitive disorders that have already been identified but do not meet the criteria for dementia syndrome, the concept of moderate cognitive disorder is used [25].

One of the best methods of correction of cognitive functions is physical therapy combined with multitasking (counting down from big numbers, twisting the ball with your hand around yourself, etc.), aerobic exercises. In particular, it should be noted the tango lessons. Tango helps to reduce the likelihood of a patient falling, and multitasking tango classes improves not only balance, movement speed, but also improves a person's cognitive abilities. Patients noted an improvement in mood, a decrease in anxiety and depression. Tango also helped to reduce the psychological discomfort that many patients experience due to motor dysfunction [26].

To correct cognitive functions, including speech, medical staff and caregivers should recommend and periodically force reading, memorizing poems, solving crosswords, puzzles, watching news and discussing them with relatives. In everyday life, it is possible to use notebooks, reminders on the phone, work with less information, etc. The study of foreign languages, the continuation of work in a moderate mode (especially for people with intellectual work) compensates well for cognitive deficits [27].

Physical therapy. In the period from 1 to 3 days after the operation, the patient needs to start bed training, 3-5 times a day for 15-20 minutes, while gradually moving from the exercise of small joints to large ones. Three days after the operation, the patient is recommended a "reclining" or sitting position. After that, if the patient has no side effects (for example, dizziness, darkening of the eyes), accompanied by a nurse or loved ones, the patient can get out of bed for exercise, gradually increasing the amount of exercise, but not overdoing it so as not to aggravate the condition [16]. For improved assistance to the patient in rehabilitation, a rehabilitologist and a physical therapy instructor are involved.

In addition to multidisciplinary rehabilitation, which is carried out after surgery, rehabilitation at home is recommended for patients. In a study where classes were held on an automated treadmill 2 times a week, the patient's mobility and walking ability improved ($p=0.02$) [28].

The International Journal of Nursing Studies published a study describing recommendations for home rehabilitation of patients to maintain their condition and prevent the deterioration of the disease. One of the important components of rehabilitation is Nordic walking (Scandinavian walking), which does not require numerous equipment.

Walking showed a positive effect on non-motor and motor symptoms, improved balance abilities and mobility of patients ($p < 0.005$) [29].

One of the most effective equipment is an exercise bike. Two studies have shown that a significant sensorimotor load occurs during active pedal rotation and that training with a high frequency contributes to the neural activity of the brain [30,31]. Constant exercise on an exercise bike as dynamic riding shows a decrease in symptoms in PD, especially rigidity and bradykinesia ($p < 0.001$) [32].

When practicing neurorehabilitation with patients, the recommendations should be followed:

Conclusions

Exploring and expanding care options for this group of patients will be crucial to ensure a high quality of life and reduce disability. DBS offers great benefits, although this procedure is not an absolute cure for Parkinson's disease, most of the work depends on the professionalism of the medical team and nursing staff. The role of nursing staff is key to the postoperative stage and the patient's subsequent administration. Nursing care and care is aimed at maximizing the improvement of the patient's condition during his stay in the postoperative period, as well as the prevention of various complications. Moreover, paramedical personnel take on the role of an instructor, providing supportive care, educating caregivers and patients themselves on the rules of postoperative care after DBS, while having a positive impact on the condition of patients. To prevent the progress of the disease, living

start exercises at a slow pace, increasing the load in the future; the conditions of the rehabilitation site should be safe and comfortable; exclude exercises that cause pain; mentally simulate classes, divide into stages (for balance, step, coordination, etc.); gradually move to rhythmic support (humming, countdown, etc. [12]).

Patients are discharged from the medical center at the discretion of the medical team consisting of a neurologist, a neurosurgeon, a rehabilitologist and a psychotherapist, after assessing that they have received the maximum benefit from the operation.

conditions and psychological state are very important for patients with PD.

It is important for nursing staff to prevent various complications at the postoperative stage, such as traumatization, pain, inflammation, slow wound healing, stress, behavioral disorders, etc., in order to maximize the effect of DBS surgery.

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**Паркинсон ауруымен ауыратын науқастардың мидың терең стимуляциясынан кейінгі күтімі:
Мейіргерлік іс қызметкерлерінің рөлі**

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Түйіндеме

Паркинсон ауруы – бұлшықеттің құрысуы, гипокинезия, тыныштықтағы тремор және постуралды тұрақсыздық сияқты қозғалыс бұзылыстарын тудыратын дофамин нейромедиаторын бөлетін нейрондардың үдемелі бұзылуымен және өлуімен сипатталатын созылмалы нейродегенеративті ауру.

Бұл мақалада авторлар мидың терең стимуляциясы үшін нейростимулятордың имплантациясы жасалған Паркинсон ауруы бар науқастардың отадан кейінгі күтімі мәселелері қарастырылады. Мейірібике ісі саласының мамандарының атап кеткен науқастардың өмір сүру сапасын жақсартудағы, олардың ауруының асқынуларының алдын алудағы және отадан кейінгі кезеңде медициналық көмек пен оңалту шараларын жүзеге асыруға қатысудағы рөлі бағаланады.

Түйін сөздер: отадан кейінгі күтім, мейіргерлік күтім, Паркинсон ауруы, мидың терең стимуляциясы, нейрооңалту, оңалту.

Уход за пациентами с болезнью Паркинсона, перенесшими глубокую стимуляцию мозга: Роль сестринского персонала

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Резюме

Болезнь Паркинсона — хроническое нейродегенеративное заболевание, обусловленное прогрессирующей деструкцией и гибелью нейронов, вырабатывающих нейромедиатор дофамин, который вызывает двигательные нарушения, такие как мышечная ригидность, гипокинезия, тремор покоя, постуральная неустойчивость.

В данной статье авторы рассматривают вопросы послеоперационного ухода за пациентами с болезнью Паркинсона, перенесшими операцию по имплантации нейростимулятора для глубокой стимуляции мозга. Оценивается роль сестринского персонала в улучшении качества жизни пациентов, в профилактике осложнения и участие в оказании лечебной и реабилитационной помощи в послеоперационном периоде.

Ключевые слова: послеоперационный уход, сестринский уход, болезнь Паркинсона, глубокая стимуляция мозга, нейрореабилитация, реабилитация.