

A MODEL OF NURSING CARE FOR A PATIENT AFTER PERCUTANEOUS CLOSURE OF AN ATRIAL SEPTAL DEFECT

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ABSTRACT

Cardiovascular diseases are among the most important challenges of modern medicine after oncological diseases. The aim of the study was to present a model of nursing care for a patient after percutaneous atrial septal defect (ASD) closure. Review method was analysis of literature on ASD and nursing care in invasive cardiology. The data were obtained from a review of the PubMed and Google Scholar electronic databases. Congenital anatomical anomalies of the ASD heart structure, in an advanced degree, lead to numerous accompanying diseases, such as frequent respiratory infections or severe circulatory failure. Summary care of the patient undergoing the ASD treatment procedure is carried out by a qualified interdisciplinary team. The provision of professional nursing care, taking into account the biopsychosocial needs of the patient, is a great professional challenge in the diagnostic and therapeutic process and postoperative recovery.

Key words: nursing care, atrial septal defect, nursing process, invasive cardiology.

INTRODUCTION

Patients with a congenital heart defect in the form of an atrial septal defect (ASD) constitute the largest group of adult patients suffering from atypical structure of the myocardium. This abnormality accounts for about 10% of all congenital heart defects diagnosed after birth and as much as 30-40% of defects diagnosed after the fourth decade of life [1]. Atrial septal defects arise as a result of abnormal prenatal development of the endocardial cushions or the second septum, resulting in the formation of various types of permanent connections between the atria. The onset of the symptoms of the disease is predisposed individually.

The literature on the subject differentiates 5 basic types of atrial septal defects:

- secondary ASD (ASD II) – statistically the most common type of defect, seen in 80-90% of the adult population, located in the area of the fossa ovalis and the surrounding tissue;
- primary ASD (ASD I) – partial atrioventricular septal defect, located near the cross of the heart, accounting for 10-15% of diagnosed heart defects;
- defect of the superior vena cava (SVC) type, accounting for 5% of diagnosed ASD defects, topographically located near the mouth of the SVC;

- inferior vena cava (IVC) defect, accounting for < 1% of clinical cases, located in the inferior part of the atrial septum;
- coronary sinus defect, accounting for < 1% of ASD-type defects, characterized by a partial or complete absence of the roof of the coronary sinus with no isolation from the left atrium [2, 3].

The increased availability of diagnostic tools has resulted in a noticeable increase in the number of elderly patients who are usually diagnosed with ASD incidentally during a routine preventive examination. The overriding diagnostic problem is the correct determination of the severity of the defect in the elderly and the advisability of potential therapy. The currently accepted view is that haemodynamically significant defects diagnosed in adults should be closed if the resistance in the pulmonary vessels does not exceed 6-8 units on the Wood scale. The guidelines of the European Society of Cardiology do not take into account the patient's age when qualifying a patient for a defect occlusion procedure [4, 5].

A diagnosed heart defect is a huge stress for the patient and their family. Nursing care in the entire diagnostic and therapeutic process requires from nurses an unconventional psychotherapeutic approach and extensive substantive knowledge of internal dis-

eases, cardiology, and cardiac surgery. Patient care at every stage of the disease creates numerous professional challenges related to the need for continuous education and improvement of practical skills. Professional nursing of people with ASD should include activities related to all areas of the patient's life, with a fundamental emphasis on the prevention of complications and interventions that allow the patient to perform self-control and self-care. Undertaking educational activities conducted by the nursing staff will allow the patient's family to be prepared for non-professional care.

The aim of this paper is to present a model of nursing care for an adult patient after percutaneous closure of an atrial septal defect.

EPIDEMIOLOGY

Atrial septal defects are the most common congenital heart defect. They occur about twice as often in women than in men. As an isolated defect, they constitute about 5-10% of genetically determined heart defects, while as a component it is diagnosed in as many as 30% of patients with complex myocardial defects. Numerous scientific studies have proven that the occurrence of ASD is associated with chromosomal inheritance, aneuploidy, transcription errors, mutations, and maternal exposure to harmful factors. Atrial septal defect can occur in various genetic syndromes – trisomy 21 (Down syndrome), trisomy 18 (Edwards syndrome), trisomy 13 (Patua syndrome), Holt-Oram syndrome, and Noonan syndrome. Several genes associated with ASD have been disclosed, including the following: *GATA4*, *TBX5*, *NKX2.5*, *ACT1*, *MYH6*, and *MYH7* [6]. Advanced maternal age and exposure of the foetus during embryonic life to pathogenetic factors such as hard drugs, alcohol, and viral diseases (rubella) may significantly predispose the unborn foetus to the development of ASD.

The incidence of congenital heart disease (CHD) has increased over the last 50 years. During the 1930s, CHD was diagnosed in less than 1 child per 1000 births. The latest epidemiological data suggest that ASD occurs in 1.6 cases per 1000 live births [7]. The noticeable increase in the incidence is probably related to the improvement of diagnostic methods and the increasing level of experience of medical staff. CHD can run in families, but it is most often sporadic and usually affects patients from developed countries with a higher socioeconomic status.

CLINICAL PICTURE

Patients with isolated atrial septal defects are often asymptomatic in childhood and adolescence. Small ASD defects (< 5 mm) are usually of no clinical significance. However, larger defects (5-10 mm) can

lead to symptoms in the fourth and fifth decades of life, and large ASD defects (> 10 mm) are classically the cause of symptoms in the third decade of life [8].

Most adults with significant atrial septal defects experience symptoms such as migraines, palpitations, syncope, recurrent respiratory infections, hepatomegaly, and shortness of breath. In the absence of arrhythmia or features of pulmonary hypertension, overloading of the right-sided heart chambers may lead to subtle symptoms of the disease, such as fatigue, worsening of exercise tolerance, or exercise dyspnoea. Late complications of a significant ASD defect include right-sided myocardial insufficiency with peripheral oedema, peripheral cyanosis, and even thromboembolic symptoms with paradoxical emboli [9].

The multitude of symptoms and possible complications of ASD generate typical care problems that pose a professional challenge for nurses. Specialist knowledge acquired in the education process and professional practice enable effective assessment of the patient's health needs, and the planning and implementation of professional care in accordance with the adopted nursing model.

DIAGNOSIS

The diagnosis of ASD is often accidental during routine auscultation in the GP's office (primary health care). In the physical examination of the patient, there is a rigid splitting of the second heart sound regardless of the respiratory phase, unlike in the physiological act. The statistical murmur for ASD II is a soft, low systolic murmur (pulmonary ejection murmur associated with increased pulmonary blood flow and initiated by non-anatomic valvular stenosis).

In ECG (resting electrocardiography), ASD II is revealed by deviation of the heart axis to the right (right diagram), incomplete right bundle branch block, and features of right ventricular hypertrophy. The consequence of ASD type II may also be supraventricular arrhythmias in the form of atrial fibrillation and flutter caused by chronic stretching of the atrial cavities and the formation of new ectopic foci. The chest roentgenogram shows features of increased pulmonary blood flow as well as dilated right ventricle and pulmonary trunk. The basic diagnostic method is transthoracic echocardiography (TTE), which enables the diagnosis and quantitative assessment of the defect. It is also necessary to perform transoesophageal echocardiography (TEE), during which a contrast in the form of saline is administered to the peripheral veins by a nurse with the simultaneous performance of the Valsalva manoeuvre. Magnetic resonance imaging and computed tomography of the heart are tests that are performed less frequently, for economic reasons and due to the limited availability of medical equipment [10].

Implementation of the therapeutic function by the nursing staff is one of the priority activities aimed at establishing a diagnosis, treatment plan, prognosis, and control of treatment effects. To diagnose ASD defects, the nurse, within the framework of his/her professional competence, performs the following diagnostic activities:

- physical examination of the circulatory system (visual examination of the chest, palpation, percussion, auscultation of the heart, pulse examination, blood pressure examination, venous circulation examination, blood pressure measurement of the venous system, capillary refill test);
- electrocardiographic examination of the heart and an initial interpretation of the ECG curve;
- collection of biological material for laboratory analysis; participation in the physical and mental preparation of the patient for imaging tests, and provision of contrast for better imaging of organs and tissues;
- participation in invasive tests such as cardiac catheterization, coronary angiography, and angiography in the operating room.

THERAPEUTIC MANAGEMENT

Several years ago, cardiac surgery was the only available method of treating ASD. Currently, because of medical progress and the development of biomedical technologies, atrial septal defects can be treated using endovascular (transvascular) techniques. Pharmaceutical therapy is a symptomatic treatment that minimizes the side effects of the defect.

The standard procedure in the treatment of ASD type II defects is the transvascular technique. The ASD II occlusion procedure is an invasive interventional procedure performed in the haemodynamic laboratory by a specialized interdisciplinary team. The procedure is classically performed under general anaesthesia, under the control of echocardiography and angiography. Dimensioning of the size of the ASD type II defect is carried out during the procedure in TEE and angiographically using fluoroscopy with a balloon. The clasp closing the defect in the interatrial septum is made of 2 discs – right and left atrial – connected with a connector. After obtaining vascular access from the femoral vein, a guidewire is introduced through the defect, usually into the left upper pulmonary vein, and then, behind the guidewire, a sheath is used to deliver the closing system, e.g. Amplatzer, CardioSEAL. In the next stage, the left atrial disc, resting on the interatrial septum, is opened, followed by the right atrial disc. In the final phase of the procedure, a test is performed to check the stability of the implanted clasp. After obtaining a positive test result, the delivery system is detached [11]. The guidelines of the European Society of Cardiology

(ESC) from 2020 recommend closure of secondary defects in patients with a significant left-to-right shunt. Currently, endovascular treatment is the method of choice. In order to perform the procedure, anatomical and morphological criteria must be met by the patient. A contraindication to type II ASD occlusion is the presence of concomitant heart defects requiring surgical intervention, partial abnormal pulmonary venous return, pulmonary hypertension, intracardiac thrombus, or sepsis. Patients of all ages benefit from defect closure by reducing dyspnoea, right ventricular failure, and improving exercise tolerance. When qualifying advanced-age patients for surgery, the risks associated with the procedure should be carefully considered in relation to the potential benefits [12].

The nursing staff take an active part in the therapeutic process of patients with ASD and are an important pillar. Nursing care begins as soon as the patient arrives at the treatment room, and consists of the following professional activities:

- the assisting nurse initially assesses the patient's general condition and their preparation for the therapeutic procedure (assesses the treatment area, skin cleanliness, checks for dentures or jewellery), checks the presence of referrals to the laboratory, written consent for the procedure, and the periprocedural safety card, and initially analyses the results of the laboratory tests. Prepares, checks, completes, and secures the necessary equipment for the procedure. Assists in the preparation of the treatment area, administers preparations for skin disinfection, covers the entire patient with a sterile treatment drape, assembles the pressure system, rinses the vascular sheath, and adds diagnostic catheters and guidewires to the table;
- the instrumenting nurse prepares the treatment table equipped with a sterile treatment package, and actively participates in the therapeutic process, cooperating with the operator;
- the anaesthesiology nurse, after admitting the patient to the treatment room, becomes acquainted with the patient's history, checks consent for general anaesthesia, anaesthesia consultation card, allergic history, and the patency of the peripheral intravenous cannula. He/she is responsible for preparing the anaesthesia station and completing the anaesthetic drugs ordered by the doctor. He/she attaches the ECG electrodes, pressure cuff, and saturation sensor and starts monitoring vital signs. Together with the doctor, he/she carefully observes the patient, analyses the parameter values on the cardiomonitor, and puts on an anaesthesia card. Efficient transfer of information and cooperation of all members of the therapeutic team during the procedure allows for early detection and appropriate intervention in the event of periprocedural complications.

NURSING CARE OF THE PATIENT AFTER PERCUTANEOUS CLOSURE OF THE ATRIAL SEPTAL DEFECT

The importance of the nursing staff in the care of the patient after endovascular occlusion of the atrial septal defect is fundamental. Nurses remain in constant contact with the patient, and it is up to them to a large extent to determine the mental state of patients, their well-being, and attitude towards the therapeutic process. Provision of professional nursing care requires knowledge of the pathophysiology of ASD defects, therapeutic and diagnostic methods, as well as possible perioperative and postoperative complications.

Nursing of the patient after the ASD II transvascular closure procedure is carried out within the cardiology department. The medical staff employed in these units have the appropriate knowledge and practical experience needed to provide proper care for the patient. To ensure the highest quality of services and guarantee the continuity of specialist care, the wards are equipped with an appropriate number of qualified staff, medicines, and necessary medical equipment. The introduction of unified standards and quality management systems for nursing procedures significantly contributes to better therapeutic effects and greater patient satisfaction with treatment results [13]. The nurse taking care of the patient after the ASD occlusion procedure undertakes nursing interventions from the moment of preparing the bed for the patient after the procedure. After receiving information from the invasive cardiology laboratory and collecting preliminary data about the patient's condition, he/she goes with the support staff or another nurse to pick up the patient (the patient is transported in the supine position due to the inguinal access procedure). After admitting the patient to the ward, the nurse familiarizes him/herself with the patient's general condition and the medical order card, thus developing an individualized and holistic nursing process by introducing the following nursing activities:

- placing the patient in a bed and providing basic information on further management (recommending that the patient stay in bed until the vascular introducer is removed by a doctor, and informing him/her about the period of maintaining compression);
- according to the medical orders card, the nurse is responsible for basic diagnostics of vital signs (heart rate, blood pressure, respiration, and body temperature measurement), including the performance of a 12-lead electrocardiogram and documentation of the obtained data;
- collection of biological material for diagnostic tests according to the medical order card;
- continuous observation of the patient for pain in the chest, late allergic symptoms, observing the lower limb from which the procedure was per-

formed, the puncture site, and the dressing for possible bleeding; cleanness of the dressing, presence of redness, swelling, or exudate);

- assisting the doctor during the removal of the introducer with aseptic rules; after the appropriate amount of time (about 8-12 hours) removing the pressure from the femoral artery and observing the puncture site, colour of the limb, thigh circumference, and securing with a sterile dressing;
- controlling the body's hydration and diuresis;
- administering prescribed medications according to the doctor's order card and observing the patient for side effects of the applied pharmacotherapy;
- conducting education of the patient and his/her family in the field of self-care at home, the essence of the disease, factors risk, healthy lifestyle, and postoperative complications;
- informing the patient about the need to take medicines systematically, periodic visits and check-ups, avoiding carrying heavy objects, bathing in hot water, and continuous self-monitoring;
- documenting the nursing interventions undertaken.

The ASD endovascular occlusion procedure is a highly specialized medical procedure. The essence of patient care is based on reliable observation and monitoring of the patient to properly prioritize his/her needs. Thanks to comprehensive care, the patient has a sense of security and a high level of services provided. As a result of the health education, the patient and his/her family are prepared for self-care and non-professional care as well as leading a healthy lifestyle with the principles of cardiovascular disease prevention. An important professional task faced by nursing staff is continuous self-education, introduction of new educational models in the work environment, and improvement of practical skills [14].

SELECTED NURSING DIAGNOSES AND INTERVENTIONS PERFORMED FOR AN ADULT PATIENT AFTER PERCUTANEOUS CLOSURE OF INTERATRIAL COMMUNICATION

Selected nursing diagnoses concern the most common problems of adult patients after a percutaneous ASD occlusion procedure. They define the scope and nature of interventions undertaken routinely by a nurse based on scientific evidence. The information is presented in Table 1.

SUMMARY

Atrial septal defects are among the most common congenital heart defects diagnosed in adult patients. Patients may manifest various clinical symptoms ranging from a slight deterioration of exercise tolerance to significant complications.

Table 1. Selected diagnoses and nursing interventions

Nursing diagnosis	The possibility of bleeding from the obtained vascular access and a haematoma within the thigh due to the use of antiproliferative drugs, fibrinolytics, heparin preparations before and during the procedure, the presence of a vascular sheath, vascular sheath bend and vessel injury, or early verticalization after the procedure
Purpose of nursing care	Minimizing the risk of bleeding, vascular malformations, or arteriovenous fistula at the site of vascular access, early detection of symptoms of hypotension, providing the patient with a sense of mental and physical safety
Nursing interventions	<ul style="list-style-type: none"> • Assessment of the vessel cannulation site for bleeding or haemorrhage to the surrounding tissues (noticeable presence of more blood, soaking of the dressing, pain, tenderness, swelling, abdominal pain, pain in the groin area) • Measurement of thigh circumference on both lower limbs and comparison of the obtained results • In the event of bleeding or haematoma, assessing the degree of its increase (informing the doctor, removing the dressing and applying pressure to the area subjected to the intervention with aseptic rules, discontinuation of anticoagulants at the doctor's order – if they were used to rinse the left vascular sheath, connecting intravenous fluids, e.g. NaCl 0.9% to fill the vascular bed according to the medical order card) • Informing the patient about the need to remain in the supine position (head elevation should not exceed 30°) with the lower limb straightened on the side of the intervention, providing the patient with information on undesirable topical side effects of abrupt movement or bending of the limb • Informing the patient about the need to apply pressure to the dressing when sneezing or coughing • Monitoring the patient's vital signs (heart rate, blood pressure, saturation, breathing) frequency every 15-30 minutes and every 2 hours, to stabilize the patient's clinical condition • Monitoring the patient's blood coagulation parameters
Nursing diagnosis	Risk of ischaemia or deep vein thrombosis in the lower limb subjected to surgery due to mechanical compression, presence of a vascular sheath, embolization with embolic material, thrombosis, limited physical activity, local tissue oedema
Purpose of nursing care	Early detection of symptoms indicating peripheral circulation disorders, significant reduction of the risk of complications caused by a decrease in peripheral blood flow within the vascular system of the lower limbs and minimization of the risk of deep vein thrombosis of the treated limb
Nursing interventions	<ul style="list-style-type: none"> • Assessment of the site of the vascular access obtained in terms of bleeding, oedema, or haematoma, and reassessment of the presence of peripheral pulse in the lower limbs, skin temperature and colour, pain or sensory disturbances, systematic monitoring of the limbs • Informing the patient of the need to signal any ailments, in particular sensory disturbances, paraesthesia, pain, changes in skin colour • Positioning the patient in a flat position with the head raised to a maximum of 30° • Thrombosis prevention through compression therapy and dorsiflexion and plantar flexion of the feet of both lower limbs • Helping the patient while eating meals, making toilet, and changing the position in bed as needed • Active cooperation in the therapeutic team, providing relevant information about the patient's condition • Monitoring coagulation system parameters • Participation in pharmacotherapy according to the medical order card • Observation of the patient for possible side effects of the pharmacotherapy
Nursing diagnosis	Feeling of shortness of breath, discomfort, and anxiety related to the occurrence of transient arrhythmias
Purpose of nursing care	Maintaining proper and effective gas exchange in the patient and minimizing discomfort and anxiety caused by cardiac arrhythmias
Nursing interventions	<ul style="list-style-type: none"> • Assessment of the patient's subjective feelings (shortness of breath, palpitations, chest pain, weakness) • Monitoring the patient's condition, taking measurements (blood pressure, pulse, number of breaths, saturation), and performing ECG according to the doctor's order • Observing the colour and humidity of the coatings • Placing the patient in a high position to facilitate the act of breathing • Oxygen supply in accordance with the medical order card • Ensuring microclimate conditions in the patient's room (air temperature 18-22°C, humidity about 60%, moderate air movement) • Informing him/her about the effectiveness of the therapy
Nursing diagnosis	The risk of infection associated with the implantation of the ASD closure occluder
Purpose of nursing care	Reducing the risk of infection, early detection of complications
Nursing interventions	<ul style="list-style-type: none"> • Assessment of risk factors favouring the occurrence of infection • Observation of the patient's sweating • Observation of the patient's well-being • Change of dressings, if necessary, with aseptic rules • Measurement of vital signs (heart rate, blood pressure, saturation, body temperature) according to the medical order card • Blood collection to determine markers of inflammation, and material for microbiological examination at the request of a doctor • Conducting antibiotic therapy before and after treatment in accordance with the medical order card • Use of prophylaxis of endocarditis until the occluder is fully covered with endothelium (antibiotic therapy for a minimum of 6 months from the date of the procedure)

Table 1. Selected diagnoses and nursing interventions (cont.)

Nursing diagnosis	The risk of early complications of ASD II endovascular closure in the form of cerebrovascular events
Purpose of nursing care	Prevention and early detection of developing clinical complications of the performed ASD II occlusion
Nursing interventions	<ul style="list-style-type: none"> • General assessment of the patient's condition • Assessment of dominant neurological symptoms using specialized clinical scales, e.g. NIH Stroke Scale, Glasgow Coma Scale • Monitoring of vital signs (heart rate, blood pressure, body temperature, respiration, state of consciousness, and pupil status) • Documenting the results of observations in a way that allows the assessment of the patient's condition over time • Keeping a fluid balance • Collection of biological material for ordered laboratory tests • Oxygen supply in accordance with the medical order card • Elimination of factors contributing to the increase in intracranial pressure, not directly related to the pathological process in the cranial cavity
Nursing diagnosis	Emotional tension caused by health concerns and the presence of a foreign body in the body
Purpose of nursing care	Significant reduction of the patient's emotional tension, improvement of mood and attitude to the therapeutic process
Nursing interventions	<ul style="list-style-type: none"> • Assessing the patient's emotional state and knowledge about the current health situation • Establishing contact with the patient, encouraging them to talk and describe their concerns • Helping the patient to accept the disease through reliable information about it • Enabling the patient to contact a psychologist • Ensuring the patient's contact with other people with a similar health situation, and seeking support from the patient's family • Informing the patient on an ongoing basis about what activities are performed with him/her and about the progress in treatment • Supporting the patient in adapting to life with a changed health situation

The essence of patient care after percutaneous ASD II closure is based on reliable observation of the patient and proper gradation of their needs, to determine priority nursing interventions. A professional nursing process takes into account the causes of the disease as well as the clinical consequences of treating atrial septal defects.

Nursing care is provided in a holistic manner and requires active cooperation with the patient and his/her family, as well as other members of the therapeutic team. Cooperation should be based on the principles of subjectivity and effective interpersonal communication. The continuous improvement of professional qualifications and the improvement of practical skills enabling the provision of care at the highest level are of significant importance in the services provided by the nursing staff.

Disclosure

The author declares no conflict of interest.

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