Basic assumptions of nursing care for a patient after rotational atherectomy

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ABSTRACT

The increase in the average age of patients contributes to the occurrence of more cases of severe calcification of the coronary arteries. Advanced pathologies are less susceptible to classical therapeutic methods, such as coronary angioplasty. An alternative technique is rotational atherectomy, which invasively removes the atherosclerotic plaque, preparing the vessel for further therapeutic interventions. The progress in the popularity of this method requires the use of knowledge at the highest level by the medical staff taking care of the patient. The risk of severe complications generates several nursing problems. Nursing staff observation, monitoring of basic vital signs, and pharmacotherapy contribute to the proper course of hospitalization. By implementing elements of health education, it strengthens the patient's attitude to the therapeutic process and the introduction of beneficial lifestyle modifications. The aim of the paper is to present the basic assumptions of nursing care for patients after rotational atherectomy.

Key words: nursing care, rotational atherectomy, invasive cardiology.

INTRODUCTION

Along with the development of modern therapeutic techniques, the life expectancy of patients with cardiac diseases is significantly extended. Factors predisposing to the occurrence of calcifications in the coronary arteries, especially diabetes, and chronic heart and kidney failure, create a classic clinical picture of patients treated with highly specialized invasive techniques [1, 2]. Numerous studies estimate that the presence of calcified atherosclerotic plaque affects 17-38% of patients diagnosed by angiography and 73% of patients diagnosed by intravascular ultrasonography (IVUS) [3-5].

The presence of massive calcifications in the coronary artery system negatively affects the therapeutic success of revascularization procedures. Significant occlusion of the lumen of the vessel makes it difficult to introduce specialized equipment, in particular balloon catheters or stents. Sharp edges of atherosclerotic lesions may damage the polymer coating of antiproliferative drug-releasing implants, leading to stent thrombosis and severe restenosis [6, 7]. Rotational atherectomy is an optional therapeutic method for patients with severe vascular lesions.

The nursing of patients after rotational atherectomy is directly related to the occurrence of numerous nursing problems. Its key aspect is the correct hierarchy of needs in a holistic spirit. Nursing interventions should be based on the highest quality scientific evidence. It requires the nursing staff to know the currently used therapies and elements of comprehensive cardiac rehabilitation or health education. The aim of this paper is to present the basic assumptions of nursing care for a patient after rotational atherectomy.

CHARACTERISTICS OF THE METHOD

Rotational atherectomy was introduced in the 1980s. The technique of the procedure was first developed by David Auth [8]. The procedure is performed in the conditions of the haemodynamics laboratory. The essence of this method is to widen the lumen of the coronary vessel by mechanically removing the calcified atherosclerotic plaque. Removal of pathological foci occurs as a result of their fragmentation into microparticles of size < 10 µm, which allows the capture of the resulting particles by the microcirculation, which does not cause peripheral embolism [9, 10].

The initial stage of the procedure is to obtain a vascular access appropriate to the clinical case (radial or femoral artery) and insertion of a metal guidewire under the guidance of a copy. Then, with its help, a special drill with a characteristic elliptical

shape covered with diamond microcrystals on the working surface is implemented. After appropriate positioning in the coronary artery, the drill is introduced into a rapid rotational movement with a frequency of 130-180 thousand revolutions per minute, thanks to which approximately 98% of the calcified atherosclerotic plaque is broken down, while saving the tissue of the coronary vessel wall [11].

The fixed components of the device are a tank with compressed air or nitrogen, synchronized with the working console and turbine, as well as a foot pedal with which the drill is started. Disposable elements in the set are a drill and a steel guide. The drill is placed in a special sheath, which allows for constant administration of a 0.9% NaCl solution and drugs during the procedure [12]. Companies producing medical equipment have introduced newer technological solutions by limiting the main components of the device to the console with a touch panel, while the function of the foot pedal is taken over by the advancer. Guides and drills are not subject to technological modification.

INDICATIONS AND CONTRAINDICATIONS FOR ROTATIONAL ATHERECTOMY

Rotational atherectomy procedures are usually performed after ineffective angioplasty of coronary arteries. Failure of the PCI procedure is usually associated with the impossibility of inserting the elements of the therapeutic kit into the area of the atherosclerotic lesion [13]. Rotational atherectomy is an alternative method of treatment that allows the avoidance of extensive surgery in the thoracic area.

Indications for rotational atherectomy:

- lack of adequate balloon dilation of the stenosis with the presence of calcifications,
- no possibility to bring therapeutic equipment to the vicinity of the lesion,
- massive calcifications in angiography,
- serious changes in coronary bifurcations,
- recanalization procedures of chronically occluded arteries after successfully forcing the occlusion site,
- rotational atherectomy of an undercompressed coronary stent.

Contraindications to rotational atherectomy:

- changes in the venous grafts,
- presence of a massive thrombus,
- dissection of the vessel,
- severe left ventricular failure,
- advanced three-vessel disease [14-16].

MOST COMMON COMPLICATIONS AND METHODS OF THEIR PREVENTION

Patients undergoing rotational atherectomy are at risk of complications equivalent to those occurring during coronary artery angioplasty. The most common are local complications in the form of haematoma or pseudoaneurysm associated with obtaining vascular access from the femoral artery. Less frequently diagnosed complications, but dangerous for the patient's life and health, include periprocedural myocardial infarction, stroke, or sudden death. Angiographic complications include dissection of the coronary vessel, perforation, and embolization of the artery with embolic material [17, 18].

The most common complications of rotational atherectomy include:

- hematoma, pseudoaneurysm,
- blood flow disorders in the treated vessel,
- stenocardial pain,
- myocardial infarction,
- coronary artery perforation,
- bradycardia, atrioventricular block,
- drill entrapment,
- guidewire tip detachment [19].

To efficiently perform the procedure and prevent complications of rotational atherectomy, a set of several important rules must be followed. The key aspect is to select the appropriate diameter of the drill to the extent of atherosclerotic lesions. Short therapeutic sessions are recommended, 15-20 seconds with a rotation frequency of about 140-150 thousand. rotations per minute. This significantly minimizes the risk of complications of thermal damage to the coronary vessels and excessive platelet aggregation [20]. In order to prevent intense friction and ensure the proper level of cooling of the system, rinsing with a mixture of isotonic sodium chloride solution with heparin and drugs relaxing the smooth muscles of blood vessel walls are recommended [21, 22]. Revascularization within the right coronary artery often requires securing the patient with a temporary endocavitary electrode, which minimizes the risk of complications associated with myocardial arrhythmia [23].

An important role in the prevention of periprocedural complications is played by the interdisciplinary team, in particular the nursing staff who remain in direct contact with the patient at every stage of treatment. The introduction of targeted preventive measures based on patient monitoring, pharmacotherapy, rehabilitation, and health education reduces the risk of adverse consequences of the implemented therapy [24].

NURSING CARE FOR PATIENTS AFTER ROTATIONAL ATHERECTOMY

The standards of nursing care for patients after rotational atherectomy are based on direct nursing functions and may use the idea of a partially compensatory system according to Dorothea Orem [25]. Modern nursing of patients in invasive cardiology uses the assumptions of nursing practice based on scientific

evidence and requires an individual approach to the patient, appropriately tailored to the level of his/her independence and advancement of the disease [26]. Nursing care should take into account the holistic impact of myocardial dysfunction on the body, the complexity of therapeutic procedures, accompanying diseases, or knowledge deficits. Health education of the patient and his/her family is an important element [27].

One of the priority tasks of the nursing staff caring for patients after non-surgical therapeutic procedures is to prepare them for active involvement in the nursing process recommended by the European Society of Cardiology (ESC) [28]. Various organizational models of health care in the world are based on close cooperation of interdisciplinary teams at institutional levels: specialist hospitals, cardiology clinics, telemonitoring, and primary care clinics.

Diagnostic tasks are based on the assessment of the patient's clinical condition, current risk factors for ischaemic heart disease, early diagnosis of complications, and key knowledge deficits. An important element is a physical examination and measurements of basic vital parameters (heart rate, blood pressure, breathing, saturation, body temperature, and state of consciousness). The manifestation of various pathological symptoms can be assessed and classified using many scales used in the clinical assessment of the patient. While performing the diagnostic function, the nursing staff also participate in the collection of biological material for laboratory tests or independently perform some of the measurements, e.g. determination of blood glucose level, blood gas analysis. The holistic assessment of the patient takes into account his/her emotional, mental, and social state [29].

Therapeutic tasks consist of direct assistance during the procedure and proper preparation of the treatment room and the necessary medical equipment. They are also based on pharmacotherapy and monitoring the patient for side effects of the therapy used. Nursing care during the patient's stay in the treatment room also includes the following:

- monitoring the patient's condition, signalled somatic ailments, control of the blood pressure curve, heart rate, electrocardiographic record, saturation,
- observation of the patient for side effects of rotational atherectomy (cardiac arrhythmias, vasospasm, vessel perforation),
- securing the puncture site with a sterile dressing,
- completing medical documentation [30].

The nurse's tasks also include participation in dietary treatment consisting in activating the patient to change his/her habits [31].

Nursing and care tasks are related to multifaceted help and support for the patient in the field of self-service deficits, which are a consequence of the therapeutic activities and changes in the cardiovascular system. The scope of care services provided is comprehensive, starting from the recognition of the scope and nature of self-care deficits through activities such as the following:

- providing appropriate conditions to maintain proper biological functions of the body,
- assistance in performing everyday activities, often related to the need to temporarily immobilize the patient after the procedure,
- solving individual problems resulting from the patient's reaction to the applied treatment [32].

Rehabilitation tasks are carried out with the help of comprehensive cardiac rehabilitation programs. The nursing staff take an active part in the patient's rehabilitation through clinical assessment, physical, psychological, and social rehabilitation, primary and secondary prevention, as well as constant monitoring of the effects of therapy [33, 34].

Educational tasks are an essential link in the procedures of invasive cardiology, especially among the group of patients after coronary artery revascularization procedures. Frequent knowledge deficits caused by the lack of reliable information cause fear and anxiety among patients and their relatives. Health education is aimed at shaping pro-health behaviours, strengthening the sense of responsibility for one's own health and the health of the closest people, with maximum involvement of the patient in the process of nursing [35, 36]. During the hospitalization of a patient after rotational atherectomy, special attention should be paid to providing reliable educational recommendations. Post-procedural information is similar to that of coronary angioplasty. The nursing staff play an important role here [37]. The scope of the information provided includes the following:

- information on further postoperative procedures (remaining in bed while maintaining pressure at the site of the vascular access obtained),
- information on avoiding lifting heavy objects (about a week after the procedure),
- information on avoiding bathing in hot water,
- self-monitoring for increased body temperature and bleeding, redness, swelling, and disturbing exudate at the puncture site,
- advising the patient about the symptoms that require urgent contact with a doctor (chest pain, palpitations, high blood pressure, increased swelling of the lower limbs),
- basic assumptions about the disease entity (causes, symptoms, treatment),
- guidelines for pharmacological therapy (taking medications as prescribed by a doctor),
- information on self-control (control of blood pressure and pulse, blood glucose, keeping self-control diaries),
- information related to dietary management (modification of lipid disorders in the treatment of hyper-

cholesterolaemia, maintaining a normal body weight, limiting salt and stimulants),
- information on physical activity (adapted physical training, comprehensive cardiac rehabilitation),
- information on methods of coping with increased emotional tension, anxiety, and stress [38, 39].

Systematic health education of the patient and his/her family positively affects preparation for self-care and leading a healthy lifestyle at home.

The tasks of health promotion are based on the primary and secondary prevention of cardiovascular diseases and consist of minimizing the factors causing the formation of atherosclerotic changes in the coronary arteries. This goal is pursued through preventive programs covering various age groups of the population and exemplary activities:
- systematic measurement of basic vital parameters, keeping self-monitoring diaries,
- laboratory tests (peripheral blood count, lipid profile, glucose level, etc.),
- regular electrocardiographic examination of the heart [40].

As part of this function, the nursing staff promote pro-health behaviours among the society.

SUMMARY

Rotational atherectomy, as one of the modern types of endovascular procedure, allows for the restoration of optimal blood supply to the myocardium, contributing directly to the reduction of somatic complaints. It reduces the risk of an episode of acute myocardial ischaemia, while improving the quality of life. The increase in the incidence of difficult and complex atherosclerotic lesions translates into increased frequency of use of this method in the daily practice of invasive cardiology. The participation of the nursing staff in the preparation of the patient for the procedure and the care during and after its completion is the pillar of the success of the procedure. Specialist knowledge, experience, and numerous professional competences translate into reducing the risk of serious complications.

Disclosure

The author declares no conflict of interest.

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