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PHYSICAL CONCEPTS OF CEREBRAL ANGIOGRAPHY AND CEREBRAL ANEURYSM EMBOIIZATION AND NURSING ASSISTANCE TO PATIENTS IN THE HEMODYNAMICS LABORATORY

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ABSTRACT

This paper evaluates common nursing practices related to patients undergoing cerebral angiography and embolization of cerebral aneurysms as described in the specialized literature, addressing the importance of nursing team involvement in the care of patients undergoing these hemodynamic procedures. The text outlines various aspects of nursing assistance from patient admission to discharge in the hemodynamics unit. The methodology includes a literature review highlighting care protocols, recommended practices, and specific interventions aimed at minimizing complications and promoting patient safety. Issues such as the systematization of nursing care, vital sign monitoring, pain management, infection prevention, and guidance on post-procedure care are discussed. The results indicate that well-structured, evidence-based nursing assistance significantly contributes to patient recovery and reduction of adverse events. The article emphasizes the need for further studies related to this topic, as well as the fundamental role of this category within the multidisciplinary team for faster recovery and prevention of post-intervention complications.

Keywords: Nursing. Cerebral Angiography. Cerebral Aneurysm. Hemodynamics. Nursing Care

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INTRODUCTION

Hemodynamic units are classified as high-complexity cardiovascular assistance units where procedures, diagnostics, and therapies are performed in the fields of interventional cardiology and extracardiac endovascular specialties, such as cerebral, peripheral, mesenteric, renal, and abdominal interventions, among others. Their facilities, specialized equipment, human resources, and technical conditions establish hemodynamics as a high-complexity healthcare unit (BRAZIL, 2004).

Cerebral angiography is a highly sensitive, invasive, and diagnostic procedure. It is utilized to diagnose cerebral issues such as cerebral arterial stenosis, cerebral aneurysms, cerebral arteriovenous malformations, intracranial hemorrhages, subarachnoid hemorrhage, ischemic strokes, and brain tumors. Despite the beneficial effects of cerebral angiography, which is regarded as a safe and effective procedure, it may be associated with the risk of morbidity and mortality (METWALY et al., 2023). A cerebral aneurysm is the dilation of a segment of an artery with a weakened wall, caused by increased normal blood pressure. It is one of the primary causes of hemorrhagic stroke, which is one of the leading reasons for severe neurological emergencies.

To diagnose intracranial aneurysms, it is essential to conduct various examinations, including cerebral angiography. The decision to indicate treatment depends on the patient's individual factors, the characteristics of the aneurysm, and treatment-related factors, which may be conducted through neurosurgery with aneurysm clipping or via percutaneous intervention, embolization, or closure of the aneurysm using stents or intracranial coils (KUNZENDORFF et al., 2018).

The nursing team plays a crucial role in the caregiving process, always striving for better care planning through the systematization of nursing care (SNC), enabling the standardization of practice and research in the field. This contributes to the construction of knowledge and clinical reasoning, facilitating the development of a care plan to individualize each patient attended to by this hemodynamic sector (BARBOSA et al., 2024). As a member of a high-complexity sector, the nursing professional must remain vigilant regarding patient monitoring, verifying the administration of medications to which the patient may be subjected, recognizing signs and symptoms of complications, allergic reactions, or any other adverse events. At the end of the procedure, it is the responsibility of the nursing professional or physician to withdraw the arterial introducer, perform compressive dressings, and transfer the patient to their hospitalization location. The quality of nursing assistance should be regarded as a dynamic process capable of identifying factors that intervene in the work process (BARBOSA et al., 2024).

Hemodynamic services are high-complexity units requiring qualified and trained professionals. The nursing team plays an essential role in preventing complications following percutaneous interventions (FRANCISCO, 2022). This research identifies several challenges faced by nurses in caring for patients undergoing cerebral angiography and endovascular embolization of cerebral aneurysms, as described in the literature on interventional neurology, addressing how the topic is currently approached, thereby understanding the quality of care that nurses consider essential for patients undergoing these procedures, while being attentive to the various complications that may arise during the pre-, intra-, and post-procedure periods, encompassing both direct patient care and the managerial organization of the unit (DA COSTA et al., 2014).

Recognizing the predictive risk factors for each patient concerning the development of vascular complications by the nursing team aids in providing assistance tailored to the individual needs of the patient (SANTOS et al., 2020). Through the systematization of care, the nurse, by providing pre- and post-procedural guidance and care during and after the procedure, aims to meet the expectations not only of patients and families but also for a smooth transition for the patient towards hospital discharge (DA COSTA et al., 2014).

Technical training and updates contribute to the nurse's acquisition of knowledge, enabling them to become disseminators of knowledge within the team, thus contributing to improved assistance and quality of life for patients, directly influencing the early resolution of potential events caused by percutaneous interventions (FRANCISCO et al., 2022).

To analyze how current literature addresses the role of nurses in relation to patients undergoing cerebral angiography and endovascular embolization of cerebral aneurysms in interventional neurology, to discuss the aspects that interfere with nursing assistance in the hemodynamic laboratory, to clarify nursing care for patients undergoing cerebral angiography and endovascular embolization of cerebral aneurysms in interventional neurology, and to document what the literature highlights concerning nursing care in this field were the primary challenges established by this article.

THEORETICAL FOUNDATION - PHYSICAL CONCEPTS UNDERPINNING CEREBRAL ANGIOGRAPHY AND ANEURYSM EMBOLIZATION

The embolization of cerebral aneurysms is a minimally invasive technique intended for the treatment of aneurysms, aimed at occluding them internally, thereby preventing the risk of rupture and associated complications such as intracranial hemorrhages. This procedure is grounded in essential physical principles that ensure its efficacy and safety. In this text, we will address the concepts of fluid mechanics, hemodynamics, and the principles of medical imaging that support aneurysm embolization, aiming to limit blood flow to the affected region.

The use of embolic agents, such as foams, coils, and liquids, facilitates the controlled occlusion of aneurysms (PIRES, 2011). Cerebral angiography is an imaging technique used to visualize the blood vessels of the brain for the purpose of evaluating cerebrovascular diseases such as aneurysms and vascular obstructions. Both aneurysm embolization and cerebral angiography depend on fundamental physics concepts, such as fluid mechanics, hemodynamics, and the interaction of radiation with matter. Understanding these aspects is crucial for ensuring the effectiveness of treatment and patient safety. The continuous advancement in research in this area has fostered the development of new techniques and the enhancement of the training of involved professionals, factors that significantly influence the achievement of desirable clinical outcomes (WOLPERT, 1992; BULLITT, 2010). Embolization procedures are guided by imaging techniques, such as digital angiography and magnetic resonance imaging, which are based on physical principles, such as the interaction of electromagnetic radiation with biological tissues, ensuring an accurate representation of vascular structures and the precise localization of the aneurysm (BAERT et al., 2012).

Traditional cerebral angiography employs X-rays, a form of ionizing electromagnetic radiation, to obtain images of blood vessels. The principle of X-ray attenuation is essential for image formation, as different tissues in the body absorb radiation in distinct ways. However, soft tissues with similar composition, predominantly proteinaceous, do not offer good resolution due to their transparency to X-rays, even those of low energy.

Therefore, the injection of a contrast medium, usually iodine-based, is common to enhance the visibility of blood vessels. These contrast agents are radiopaque, meaning they absorb a greater amount of X-rays compared to the surrounding tissues, making blood vessels more visible in the obtained images (LUSIC, GRINSTAFF, 2013). The contrast is administered directly into the bloodstream, allowing for differentiation between vascular structures and adjacent tissues. Iodine possesses high electron density, enabling it to absorb X-rays more effectively than normal body tissues. This results in a significant increase in contrast in the images, thus allowing better visualization of internal structures. For the utilization of iodine as a contrast medium in X-ray imaging, factors such as its solubility in water and the thickness of the contrast medium must be considered (NAJJAR, 2024).

The iodine compounds typically used as contrast agents are water-soluble, facilitating their intravenous or oral administration, depending on the type of examination. Solubility is essential to ensure that the contrast agent flows adequately through the circulatory system or the digestive tract. To create a visible contrast in the images, iodine must be administered in a sufficient quantity to generate a significant difference in X-ray absorption between adjacent tissues. Therefore, the concentration of the contrast medium is a crucial factor for the quality of the obtained images. Regarding the process of aneurysm embolization, various characteristics and physical concepts are involved. The technique employs an X-ray tube and a detector that converts the absorbed radiation into dynamic images. This approach is vital in interventional procedures, such as the placement of stents or embolizations, as it provides instant feedback on vascular anatomy and perfusion (HOLDEN., 2016).

Fluid mechanics is essential for understanding blood behavior in relation to aneurysms, as the abnormal dilation of a blood vessel alters local blood flow, causing turbulence that can increase pressure on the vessel walls. The Bernoulli equation is not applicable in turbulent flow regimes, but it provides a good conceptual understanding of the process, as it describes the conservation of energy in a moving fluid, allowing comprehension of how variations in flow velocity and pressure interact (PENN et al., 2011). Hemodynamic analysis is crucial for assessing aneurysms since the pressure on the walls of the aneurysm and the dynamics of blood flow determine the probability of rupture. Computational models, such as computational fluid dynamics (CFD), are frequently used to simulate blood flow and provide data on the forces acting on the aneurysm wall. CFD simulations using anatomical vascular geometries based on medical imaging have demonstrated significant potential as tools for the diagnosis and treatment of cerebral aneurysms (CAMPO-DEAÑO et al., 2015). These models are fundamental for intervention planning and patient selection. In some cases, liquid agents, such as Onyx, are used due to their rheological properties that facilitate the filling and occlusion of more complex aneurysms. The choice of embolic agent is influenced by factors such as viscosity and the ability to penetrate small branches of the aneurysm (PAL, 2023). Based on the discussion in this section, it can be asserted that both cerebral angiography and aneurysm embolization represent a sophisticated combination of physical principles, allowing the visualization of the brain's blood vessels and the control of blood flow, respectively.

The use of ionizing radiation, combined with the use of contrast media and advanced imaging techniques, provides a detailed understanding of vascular anatomy, being essential for the diagnosis and treatment of various cerebrovascular pathologies. The continuous advancement of imaging technologies promises to further enhance the precision and safety of these procedures.

METHODOLOGY

This is an integrative bibliographic review conducted through an evidence-based literature survey. This type of review is a method that provides a synthesis of knowledge and incorporates the applicability of significant study results in practice. Databases such as LILACS (Latin American and Caribbean Literature in Health Sciences), BDENF (Nursing Database), and the SCIELO (Scientific Electronic Library Online) collection were utilized via Google Scholar, using descriptors such as "nursing," "cerebral angiography," "cerebral aneurysm," "hemodynamics," and "nursing care." The search covered the last ten years, from 2014 to 2024, with a minimum of ten scientific articles selected for this research. Emphasis was placed on articles addressing issues related to the chosen topic published in English, Portuguese, and Spanish, as well as in the format of articles, dissertations, and theses, with abstracts available in the databases, while excluding studies unrelated to the topic or the publication period (ASSUNÇÃO, 2019).

RESULTS AND DISCUSSION

CEREBRAL ANGIOGRAPHY

In 1896, the first recorded X-ray angiography of blood vessels was performed on cadavers. However, it was in 1927 that Egas Moniz, a Portuguese neurologist, pioneered the in vivo use of cerebral angiography, with four of his first six patients experiencing complications (two cases of Horner's syndrome, one transient aphasia, and one cerebrovascular accident). Over time, the techniques of angiography improved, alongside advancements in iodinated contrast agents and safer imaging practices, allowing catheter angiography to become a reliable diagnostic tool, albeit still associated with measurable complication rates. It remains an important invasive procedure in vascular neurology and continues to be the gold standard for delineating vascular lesions of the brain (and the spinal cord) (ALAKBARZADE et al., 2018, v. 18, no. 5, pp. 393-398, translation ours). Despite being considered a safe and effective procedure, cerebral angiography may be associated with risks of morbidity and mortality (METWALY et al., 2023, v. 11, no. 36, pp. 32-43, translation ours).

Diagnostic angiography is generally performed with the patient awake; a local anesthetic is applied at the puncture site, and mild sedation is used to enhance comfort and reduce movement, particularly if the patient is agitated or confused (ALAKBARZADE et al., 2018, v. 18, no. 5, pp. 393-398, translation ours).

Initially, to perform the procedure, it is necessary to obtain safe arterial access, preferably via the transfemoral route, although the radial or brachial artery can also be safely used. The common femoral artery is punctured adjacent to the femoral head, which is a compressible site, and a diagnostic catheter is introduced through a sheath and guided with a hydrophilic wire that allows for non-traumatic navigation of the vasculature. The catheter is then maneuvered under direct fluoroscopic visualization to the descending aorta and subsequently to the major cervical vessels. Typically, a cerebral arteriography of three vessels begins with the right common carotid artery, followed by the left, and then the left vertebral artery in patients with left vertebral artery dominance. In patients who may poorly tolerate the angiogram, the vessel of interest should be examined first in case the procedure needs to be terminated early (ALAKBARZADE et al., 2018, v. 18, no. 5, pp. 393-398, translation ours).

At the conclusion of the procedure, the catheter and sheath are removed and hemostasis is achieved either through direct manual or mechanical compression of the femoral artery or by implementing a vascular closure device. After manual compression, patients are advised to remain supine for six hours with the punctured limb immobilized (ALAKBARZADE et al., 2018, v. 18, no. 5, pp. 393-398, translation ours).

During the procedure, the patient generally does not feel the catheter when it is within the body, and the contrast injection is not painful. Most individuals perceive it as a sensation of warmth in the distribution of the selected vessel or report other sensations, such as flashes of light behind one or both eyes or intermittent dizziness (ALAKBARZADE et al., 2018, v. 18, no. 5, pp. 393-398, translation ours).

The most common non-neurological complication of cerebral angiography is a hematoma at the arterial puncture site. Retroperitoneal hematoma resulting from a puncture site above the inguinal ligament is rare. It can be asymptomatic and self-limiting but may lead to cardiovascular compromise, necessitating transfusion and/or surgical intervention. Severe allergic reactions to iodinated contrast are rare complications and should be treated as medical emergencies. Assessment of the airway, respiratory circulation and oxygen, intravenous fluid, hydrocortisone, and epinephrine should be considered as appropriate under such circumstances. Acute ischemic stroke, one of the most severe complications, may result from thromboembolism or iatrogenic dissection of the vessel. Rupture of atherosclerotic plaques and vascular dissections are other sources of cerebral emboli and vessel occlusions. Thromboembolic events may also be associated with non-ionic contrast agents, while iatrogenic dissection remains an uncommon complication (ALAKBARZADE et al., 2018, v. 18, no. 5, pp. 393-398, translation ours).

ENDOVASCULAR EMBOLIZATION OF CEREBRAL ANEURYSM

Cerebral arteriography or cerebral angiography has become the gold standard technique for the diagnosis and treatment of many cerebrovascular diseases, particularly in the management of cerebral aneurysms (CLERENCIA et al., 2023, vol. 58, pp. 4-13, our translation).

> Intracranial aneurysms are local dilations of cerebral blood vessels that pose a potential risk for rupture, which can result in subarachnoid hemorrhage (ZHANG; CLATERBUCK, 2008). Subarachnoid hemorrhage is the most feared consequence of unruptured intracranial aneurysms, as it leads to high rates of mortality, functional dependency, as well as psychological and neurological sequelae (WILLIAMS; JUNIOR, 2013) (SARMENTO, 2018, p. 17).

Symptomatic aneurysms are those that, once ruptured, progress to subarachnoid hemorrhage (SAH) or produce symptoms such as headache, seizures, cranial nerve paralysis, and focal neurological deficits; however, unruptured aneurysms remain asymptomatic in the vast majority of cases. When unexpectedly discovered in patients being investigated for other pathologies, they are referred to as incidental aneurysms (SARMENTO, 2018). Aneurysms can be classified according to various schemes, with the most common distinction being between ruptured and unruptured. Further classification may be made based on morphology (saccular or nonsaccular aneurysms), location, and size (small < 10 mm in diameter, large 10-25 mm in diameter, and giant > 25 mm in diameter), with the morphological classification being one of the most important. Saccular aneurysms have a balloon-like shape with a small neck connecting them to the parent artery, while nonsaccular aneurysms exhibit a diffuse shape without an identifiable neck, characterized by dilation and stretching of the artery, and may be classified as acute or chronic (SARMENTO, 2018).

Saccular cerebral aneurysms possess a neck amenable to treatment, whereas fusiform aneurysms are lesions that require alternative, non-conventional and technically challenging intervention methods to achieve circumferential dissection of the artery (SARMENTO, 2018). Both surgical and endovascular treatments share the common goal of preventing re-bleeding of the aneurysm while maintaining the best possible neurological status.

> In the early 1990s, platinum coils, commonly referred to as "coils," were introduced into clinical practice. Through an endovascular technique, and with the assistance of a microcatheter, the coils are deposited within the aneurysmal sac until all spaces are filled.
> (...)
> The aforementioned procedure is known as embolization and was first performed in 1990 by Guido Guglielmi and Fernando Viñuela at the University of California, Los Angeles (MENA, 2013). In their study on assisted techniques for the endovascular treatment of intracranial aneurysms, Martínez et al. (2013) state that significant efforts have been directed towards the development of such techniques and treatments to

> achieve more stable occlusions, thereby comparing recanalization rates to those of microsurgery.
> (...)
> The width of the neck of the cerebral aneurysm is one of the limiting factors for endovascular treatment, as its morphological characteristics significantly increase the risk of platinum coils migrating into the artery (MARTÍNEZ et al., 2013) (SARMENTO, 2018, p. 22).
> .

Regarding complications specifically associated with aneurysm embolizations, there is a risk of arterial perforation during the treatment of ruptured aneurysms compared to the delayed treatment of incidentally diagnosed cerebral aneurysms (CLERENCIA et al., 2023, vol. 58, pp. 4-13, our translation). The occurrence of local and intracranial complications arising from embolization procedures can lead to clinical deterioration (ranging from mild to severe) in patients and an increase in hospitalization time.

Aneurysm embolizations are typically scheduled, whereas all reperfusion treatments in ischemic stroke are urgent. Nursing care following aneurysm embolizations should pay special attention to the puncture sites in patients who have undergone prolonged procedures and to possible neurological clinical changes in patients (CLERENCIA et al., 2023, vol. 58, pp. 4-13, our translation). Interventional cerebral angiography is relatively frequently associated with iatrogenic dissections, more so than purely diagnostic cerebral angiography, due to the more invasive and manipulatively intense nature of the procedure (ALAKBARZADE et al., 2018, vol. 18, no. 5, pp. 393-398, our translation).

Cerebral gas embolism is rare and can be prevented by connecting air filters to the catheter and the syringe of the contrast medium, reducing the injection rate of the medium, minimizing the number of microcatheter executions, and ensuring the proper preparation of the catheter. Arterial perforation is typically related to distal navigation of the guidewire and is rarely associated with the stent or balloon during the aneurysm intervention. Perforation of a small distal artery can be difficult to identify during the procedure if the contrast medium leaks slowly without visible extravasation, leading to progressive extensive bleeding (ALAKBARZADE et al., 2018, vol. 18, no. 5, pp. 393-398, our translation).

NURSING CARE FOR PATIENTS UNDERGOING CEREBRAL ANGIOGRAPHY AND ENDOVASCULAR EMBOLIZATION OF CEREBRAL ANEURYSM

The neurointervention team is responsible for the initial care of patients arriving at the hemodynamic laboratory for neurovascular procedures, tasked with therapeutic decision-making, carrying out the procedure, obtaining informed consent, prescribing medications, and providing care. However, after these initial interactions, it is the nursing staff who will be continuously present to assist the patient.

Nursing assistance is involved during all phases that the patient will undergo; these phases are divided into pre-procedure, trans-procedure, and post-procedure, encompassing everything from patient arrival at the unit to discharge instructions (RÉGIS et al., 2017). The pre-procedure begins with the patient's admission to the anesthetic recovery room (SRPA) until the transfer to the procedure room, where the trans-procedure occurs. After the procedure is completed, the patient returns to the SRPA, where the post-procedure phase begins until discharge from the hemodynamic unit.

Nursing care should be formalized to prevent and detect complications early, with heightened attention. Pain may lead to hypertension, which can evolve into increased bleeding at the puncture site, resulting in serious complications (LIMA, 2019).

The systematization of nursing assistance (SAE) plays a vital role, characterizing and providing understanding for the delivery of care. Nursing diagnoses, as one of the stages of SAE, contribute to the work process through the quality of actions taken. Understanding the procedures performed, their benefits, risks, and potential complications is essential for implementing appropriate and necessary interventions in the care plan, developing, organizing, and standardizing the assistance for patients undergoing procedures while valuing individualities, thereby enhancing team performance and, consequently, outcomes (RÉGIS et al., 2017).

NURSING ASSISTANCE IN PRE-, INTRA- AND POST-INTERVENTION

The nursing team in the hemodynamics department is responsible for preparing the patient prior to the commencement of the procedure. A brief checklist of information is utilized to ensure that the procedure occurs safely, minimizing errors and ensuring proper care (KERN, SORAJJA, and LIM, 2017). According to Kern, Sorajja, and Lim (2017), the checklist involves verifying the identification bracelet, laboratory tests—particularly hemoglobin, platelets, urea, creatinine, coagulation profile (INR: international normalized ratio and activity), sodium, and potassium—conducting a medical history assessment for pre-existing conditions, confirming fasting duration, understanding the medications the patient takes and those that were discontinued days and hours prior to the procedure, ensuring the physician has provided an informed consent form, thus keeping the patient informed about the procedure and its risks, maintaining patent venous access, checking for any allergies (including food and drug allergies), advising the removal of dentures and ornaments if applicable, and installing multiparametric monitoring (heart rate, blood pressure, and oxygen saturation). As a general rule, according to the American Society of Anesthesiologists, fasting is recommended for four to eight hours, with four hours for clear liquids and eight hours for solid foods (KERN, SORAJJA, and LIM, 2017). In the pre-intervention phase, venous access for medication administration should be established; additionally, it is imperative to evaluate the emotional state, encourage the patient to express fears and anxieties, provide education, and reassure to minimize apprehension. Trichotomy at the catheter insertion site, as well as the installation of multiparametric monitoring (heart rate, blood pressure, and oxygen saturation), should also be performed.

The responsibilities of nursing during the intra-intervention phase, as outlined by Régis et al. (2017) and Lima (2019), include familiarizing oneself with the patient's medical record and essential information, installing multiparametric monitoring, and ensuring a patent venous access. The physician will don a sterile gown and gloves and subsequently open the necessary sterilized materials for the procedure, label medications, containers, and other solutions, and ensure that the team is equipped with lead gowns in the procedure room. After the catheter is removed, direct or mechanical pressure is applied for hemostasis, and the site is monitored while a compressive dressing is applied.

In the post-procedure period, the patient should be informed that if the procedure was performed percutaneously through the femoral or brachial artery, they will remain in bed for six hours, with the punctured limb kept straight and the head elevated at 30 degrees. The importance of keeping the limb immobilized should be explained, and soft immobilizers should be applied if necessary. The catheter puncture site should be monitored, temperature, coloration, and the presence of any complaints of pain, numbness, or tingling should be assessed. The patient should be instructed to report any pain, bleeding, or discomfort to the responsible parties, along with discharge instructions (RÉGIS et al., 2017). Nursing should evaluate the temperature and coloration of the affected limb as well as any complaints of pain, numbness, or tingling to determine signs of arterial insufficiency, with any changes reported immediately (RÉGIS et al., 2017). The nursing assistance process (SAE) allows nurses to identify the presence of affected basic human needs in patients admitted to specific units, enabling the classification of diagnoses, establishment of interventions, and provision of nursing care grounded in scientific knowledge, thereby facilitating objective and individualized care (RÉGIS et al., 2017).

Among the complications/risks associated with neurointervention procedures, hematoma, allergic reactions, acute ischemic stroke, arterial perforation during aneurysm treatment, gas embolisms, and restenosis in the case of stent embolization can be listed. Key nursing diagnoses include anxiety/fear, risk of bleeding, risk of allergic response, and risk of reduced cerebral tissue perfusion. Several nursing diagnoses are frequently utilized in hemodynamics across the three stages: pre-, intra-, and post-procedure. Anxiety/fear is part of the phase preceding the procedures, characterized by the patient's verbalization of knowledge deficits and can persist during the post-procedure stage, manifesting as nervousness and constant questioning about the examination results (RÉGIS et al., 2017). The risk of bleeding is a diagnosis that arises due to arterial puncture devices remaining inserted in the patient during the intra-procedure stage as well as for several hours post-procedure (RÉGIS et al., 2017). The risk for allergic reactions is a potential diagnosis during the procedure itself, with the primary risk factor being the use of iodinated contrast media (RÉGIS et al., 2017). Impaired skin integrity is characterized by hematomas, bruises, rashes, and skin continuity issues arising post-procedure, allergic reactions to adhesive and venous catheters, as well as the risk of reduced peripheral tissue perfusion, which has the risk factor of interruption of arterial and/or venous flow due to thrombosis, emboli, or arterial spasms, being relevant post-procedure (RÉGIS et al., 2017). According to Lima (2019), the reduction of hemorrhagic events ensures increased survival rates, resulting in shorter hospital stays. Effective compression at the puncture site using the correct technique minimizes the risk of bleeding. Absolute bed rest should be maintained for a minimum of six to twelve hours, during which temperature, coloration, blood flow, and the extremities of the utilized limb should be closely monitored. It is important to consult with the responsible physician regarding the need for antiplatelet medications (acetylsalicylic acid [ASA], clopidogrel bisulfate, or ticagrelor) following cerebral aneurysm embolization for cases involving stents. After completion of the procedure, the patient will continue to be monitored by the nursing team in the post-anesthesia recovery room (SRPA) for a duration determined by the neurointerventionist and/or anesthesiologist responsible for the procedure until discharged from the hemodynamics unit.

CONCLUSIONS

Hemodynamics constitutes a high-complexity unit that requires trained and qualified professionals, and the nursing team plays a crucial role from admission to the prevention of complications following percutaneous interventions and post-discharge care. Both aneurysm embolization and cerebral angiography depend on fundamental concepts of Physics, such as fluid mechanics, hemodynamics, and the interaction of radiation with matter. Understanding these aspects is part of the essential professional training necessary to ensure the effectiveness of treatment and patient safety. The provision of care before, during, and after procedures—whether diagnostic or therapeutic—facilitates an improvement in the patient's clinical condition, which is favorable when high-quality care is delivered. An important aspect of nursing care extends beyond technical-scientific knowledge to include a humanized approach, ensuring that the patient feels safe and confident with the care team, an aspect not fully addressed and which could be further explored in future studies. The formulation and execution of nursing care provide patients undergoing diagnostic or therapeutic procedures with conditions for a faster recovery free from predictable complications through planned nursing assistance, enabling monitoring of the work performed with the patient, assessment and reformulation of the care program when necessary, and supervising the nursing team based on the quality of care offered to the patient. However, due to the scarcity of published studies, there is a pressing need for new knowledge related to diagnosis, intervention, and nursing care in interventional neurology, ensuring primarily the prevention of post-intervention complications.

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