

Perioperative Nursing Care for Patients Undergoing Coronary Angiography using the Transradial Approach

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Abstract

Cardiovascular diseases contribute to the deaths of millions of individuals each year. Among these diseases, coronary artery disease stands out as a condition that requires urgent treatment and can lead to sudden death. Coronary angiography remains the gold standard for the diagnosis and treatment of coronary artery disease, benefiting from advancements in science and technology. In recent years, there has been a growing emphasis on the use of the radial artery for coronary artery disease diagnosis and treatment within the field of coronary angiography. Compared to femoral and brachial arteries, the radial artery offers several advantages in accessing the coronary vessels. Nurses, as integral members of the multidisciplinary healthcare system, play a crucial role in all stages of the process, from pre-transradial angiography to the procedure itself and post-procedure care, contributing to the quality of patient care and the healthcare system. This review aims to elucidate the roles of nurses in the increasingly utilized transradial angiography method worldwide and provide an overview of perioperative nursing care based on the latest literature.

Keywords: Nursing, Nursing Care, Angiography, Transradial Angiography

Transradial Yöntem ile Koroner Anjiyografi Olan Hastaların Perioperatif Hemşirelik Bakımı

Özet

Kardiyovasküler hastalıklar her yıl milyonlarca insanın ölümüne neden olmaktadır. Koroner arter hastalığı kardiyovasküler hastalıklar içerisinde acil tedavi edilmesi gereken ve ani ölüme sebep olan hastalıklar arasındadır. Koroner anjiyografi, koroner arter hastalığının tanı ve tedavisinde altın standart olarak yerini korumaktadır. Bilim ve teknolojinin sağladığı gelişmelerle beraber koroner anjiyografide, radial arter aracılığı ile koroner damar hastalığının tanı ve tedavisi son yıllarda önem kazanmaktadır. Femoral ve brakial arterlere nispeten radial arter aracılığı ile koroner damarlara erişilmesinin daha avantajlı olduğu bilinmektedir. Multidisipliner sağlık sisteminin ayrılmaz bir parçası olan hemşireler, transradial anjiyografi öncesi, sırası ve sonrasında sürecin tüm aşamasında bulunarak hasta bakım kalitesine ve sağlık sistemine fayda sağlamaktadır. Bu derlemede, son yıllarda tüm dünyada kullanımı yaygınlaşan transradial anjiyografi yönteminde hemşirenin rolleri ve perioperatif hemşirelik bakımının son literatür ışığında açıklanması amaçlanmaktadır.

Anahtar Kelimeler: Hemşirelik, Hemşirelik Bakımı, Anjiyografi, Transradial Anjiyografi

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INTRODUCTION

According to the data from the World Health Organization (WHO), approximately 17.9 million people lose their lives each year due to cardiovascular diseases (1,2). Among these diseases are coronary artery disease, cardiomyopathy, heart failure, hypertensive heart disease, heart valve diseases, cardiac arrhythmias, and peripheral vascular diseases (3). While advanced age, gender, and family history are considered non-modifiable risk factors for cardiovascular diseases in the literature, smoking, hypertension, hyperlipidemia, diabetes mellitus, obesity, stress, and sedentary lifestyle are categorized as modifiable risk factors (4,5). Controlling risk factors, early screenings, and implementing medical and surgical treatments contribute to reducing mortality rates from cardiovascular diseases. Among them, coronary artery disease significantly impacts mortality and morbidity, frequently leading to death. Coronary artery disease occurs as a result of changes in vascular lumen due to atherosclerosis, leading to stenosis and blockages in the lumen (3,5,6). Patient history, physical examination, electrocardiography, exercise stress test, and blood tests (CK, CK-MB, and Troponin) are important diagnostic methods for this disease. However, coronary angiography (CAG) is considered the gold standard for the diagnosis and treatment of this disease (7). CAG has been used for many years in the visualization and

treatment of coronary arteries. CAG involves creating an access route to the target organ through a catheter from peripheral or main arteries to visualize the heart's vessels and, if necessary, restore blood flow in the coronary arteries using coronary stents (8). The choice of artery for catheter placement varies based on the patient's clinical condition and the doctor's clinical experience, but during CAG, femoral, radial, brachial, and axillary arteries are used to access the heart vessels. The femoral artery has been the most commonly used route for CAG for many years. However, the radial artery approach has gained a place in the literature as an alternative method in recent years due to the advantages it offers over the femoral artery. When examining several randomised controlled studies, the radial artery approach provides significant advantages over the femoral artery in terms of vascular complications such as bleeding risk, pseudoaneurysm, vasculitis, hematoma, vascular thrombosis, and emboli. It also offers important benefits such as increased patient satisfaction, reduced costs, and decreased mortality rate (9–14). Despite all these advantages, the transradial CAG procedure has some disadvantages, including prolonged exposure of healthcare professionals and the patient to radiation, requiring a longer learning curve, limited availability of suitable catheter sizes, the risk of hematoma, arteriovenous fistula, radial artery spasm, radial artery perforation, and

a high incidence of radial artery occlusion after the procedure (11,15,16). The use of the radial artery as a graft in coronary artery bypass surgery becomes challenging when transradial CAG is applied. Additionally, although rare, complications such as infection, mycotic aneurysms, pseudoaneurysm, limb ischemia, nerve damage, and regional pain can occur after transradial CAG (17,18).

Nurses play crucial roles in preventing, minimizing, monitoring, and providing patient care regarding all the complications mentioned above during transradial CAG, both before, during, and after the procedure. This review aims to elucidate the roles of nurses at every stage of transradial CAG, a procedure that is becoming increasingly popular worldwide and requires more specialized care compared to femoral artery angiography, and to provide perioperative care to patients undergoing transradial CAG based on the latest literature.

Responsibilities of Nurses Prior to Transradial Angiography Dataset

Nurses play critical and professional roles in the holistic healthcare system. Just like in other fields, nurses carry out healthcare services in a professional manner with modern nursing roles, such as caregivers, educators, researchers, managers, decision-makers, advocates, rehabilitators, comforters, healers, and consultants, both before, during, and after transradial CAG (19). Nursing care in transradial

CAG should be based on evidence-based nursing care (20). Nurses should have a checklist to ensure quality care and standardization. This checklist should include evaluating procedural indications, the patient's medical history, physical examination, informed consent form, analgesia status, as well as information on complete blood count measurements, serum electrolyte levels, renal function status, and anticoagulation status. In the clinical setting, patient monitoring, oxygen saturation monitoring, and oxygen support should be provided. The patient's 12-lead electrocardiography (ECG) should be obtained before the CAG procedure, and their allergy status, previous heparin treatment, and radial artery evaluation should also be included in the checklist (21). The time between the patient's arrival at the hospital and achieving vascular clearance in the angiography laboratory for those with acute myocardial infarction symptoms (Door to balloon time) improves the procedure's success and reduces the risk of possible complications after the procedure. Moreover, it reduces the patient's length of hospitalization and extends their lifespan (22,23). Adequate preparation should be made for the patient before the procedure, and their safe transfer to the cardiac catheter laboratory should be ensured. Nurses should coordinate and collaborate with the entire team to provide the best care as

efficiently as possible during all these preparations and procedures mentioned above.

The nursing education process begins with the admission of the patient to the hospital and becomes an integral part of the treatment. During this education process, discharge education should also be initiated. Prior to the procedure, the patient and their family should be informed, and psychological and emotional support should be provided. Additionally, information about the procedure, physical activity limitations, general physical condition, management of coexisting diseases, regulation of post-procedural medication, potential complications, and the next follow-up appointment should be communicated to the patient (21,24). Nurses should conduct patient education before interventional CAG using various educational materials to reduce patient stress and enhance patient satisfaction. Nurses are encouraged to utilize different educational models for patient education. The use of educational methods that appeal to multiple sensory modalities is recommended for lasting behavior change (25). Studies in the literature have shown that video-based education provided to patients prior to transradial CAG reduces their stress levels (26,27). Minimizing medical errors and ensuring optimal post-treatment quality of life for patients requires educating both the patients and their families, which holds significant importance (28). Therefore, meeting the educational needs of

patients and their families is believed to enhance the quality of patient care (29).

The Role and Importance of Nurses During Transradial Angiography

Nurses are an integral part of the team in the cardiac catheter laboratory and play a crucial role during transradial angiography. Throughout the procedure, they provide support to the team and ensure the assessment, monitoring, and delivery of optimal healthcare during significant complications such as myocardial ischemia, vascular access site complications, and contrast-induced nephropathy. Additionally, nurses should support the patient's comfort within the angiography unit, ensuring proper positioning and preserving patient privacy. Nurses are responsible for various tasks during the procedure, including the initial reception of the patient in the angiography unit, patient identification, monitoring of vital signs, consciousness assessment, and continuous monitoring of these parameters throughout the procedure (21). Before commencing the procedure, nurses must verify the patency of the vascular access, prepare and administer medications, ensure the availability of laboratory supplies, and carry out necessary checks. During the procedure, it is essential to be cautious not to obstruct the procedure area and the operator's workspace with equipment, such as equipment used for patient monitoring and peripheral venous catheters or sets. In case of the need for a

switch to femoral access due to unforeseen circumstances (persistent arterial spasm, vascular injury, severe pain, or tortuous vessel structure), nurses should have the necessary materials and catheters ready.

Before transradial angiography, local anesthetic agents are used to numb the procedure area. Subsequently, the wrist is placed in dorsiflexion position, and the arterial puncture is performed by the operator. This position facilitates arterial puncture and aids the advancement of guide wires and catheters. To prevent vessel injury and radial artery occlusion (RAO), a hydrophilic catheter with a size of 6F or smaller is selected for puncture and placed into the artery. Administration of verapamil/nitroglycerin to prevent arterial spasm and heparin to prevent thrombosis during the procedure is recommended (14,30). In emergency situations, nurses play a critical role in interventions that may require surgical vascular repair or involve massive bleeding. They should check the patient's blood group and prepare for transfusions if necessary. Furthermore, nurses should monitor for potential allergic reactions to contrast media and local anesthetic agents. During the procedure, blood clots dislodged from the heart or blood vessels can cause stroke and embolism in other vital organs, therefore, nurses should periodically evaluate the patient's consciousness and respiration (31). Nurses working in the

angiography unit should be competent in managing hemodynamic instability, arrhythmias, resuscitation, and the use of medical devices, as well as in providing respiratory support and utilizing mechanical ventilators until the anesthesia team arrives (32).

Continuous verbal communication with the patient during the procedure and informing the patient and their family about the procedure are essential. After the procedure, nurses should assess the patient's blood pressure, pulse, bleeding, radial artery closure device, urinary output, pain, and consciousness. Patients should be transferred to the clinic in a monitored state with necessary equipment, such as defibrillators readily available for emergency situations. Information regarding the duration of the procedure, treatment administered to the patient, medications used during the procedure, the patient's vital signs during the procedure, and input-output monitoring should be communicated to the clinic nurse during the handover.

Post-procedural Nursing Care and Patient Follow-up after Transradial Coronary Angiography

One of the most important complications that can occur in the early and late post-procedural periods of patients undergoing transradial CAG is Radial Artery Occlusion (RAO). RAO can develop depending on the amount of anticoagulant used during the procedure, the size

of the sheath catheter, the duration of catheter placement in the artery, multiple catheter insertions, vascular injury, vascular structure, and the time and intensity of pressure applied to the puncture site after the procedure (33). Therefore, it is recommended to check radial artery flow post-procedure and before discharge from the clinic (34). Nurses should be knowledgeable about post-procedural anticoagulant use and stay in communication with the physician to monitor the patient's treatment. Checks on the closure device used to stop bleeding at the puncture site should be conducted, and it is recommended to elevate and keep the arm used for the procedure visibly elevated at 30 degrees with slight flexion for at least 6 hours after the procedure (35). Any circulatory disturbances in the extremity used for the procedure, such as color, temperature, tenderness, numbness, tingling, capillary refill time, and pain, should be carefully observed and assessed. Moreover, the puncture site should be monitored for bleeding, hematoma, and infection. The frequency of observation should be determined according to the patient's condition, and it should be understood that complications are not limited to just a few hours after the procedure. The patient should be monitored, and vital signs (pulse, rhythm, pain, blood pressure, and temperature) should be checked every 15 minutes in the first 2 hours, and the obtained data should be recorded (21,24,36).

After transradial CAG, patients can mobilize immediately. If sedation was administered during the procedure, patients can mobilize once the effects of sedation have worn off (21). The patient should be informed about the closure device, and both the patient and their family should be educated about how to communicate with the nurse in case of a warm sensation or possible bleeding at the procedure site. The nurse should check the puncture site, monitor the pulse, remove the radial artery closure device, and then perform follow-up and dressing of the site.

Immediately after the procedure, the patient's 12-lead ECG should be taken and compared with the pre-procedural ECG. The patient should be observed for any arrhythmias. Acute occlusion of the vessel (acute closure) can occur during the procedure and within the first 24 hours after the procedure. Monitoring the patient's pain is of great importance after the procedure. If the patient complains of unstable chest pain, the 12-lead ECG should be repeated, compared with the baseline ECG, and the doctor should be informed. Oxygen, nitroglycerin, and analgesic treatments should be initiated with the doctor's request if deemed necessary (8,36).

The patient should be encouraged to drink plenty of fluids after the procedure to facilitate the elimination of the contrast medium from the body. Signs of contrast-induced nephropathy, such as urea, electrolytes, glomerular filtration rate, and urine output, should be monitored and

compared with pre-procedural values. Patients should be monitored for urinary retention for 6 hours after the procedure, and those experiencing difficulty or discomfort in urination should undergo urinary catheterization for continuous intake-output monitoring.

After the CAG, patients should be informed about their condition and risk factors, and discharge education should be provided comprehensively in cognitive, sensory, and behavioral aspects (14,37,38). In discharge education, to minimize and prevent the risk of radial artery complications, patients should avoid driving for the first 24 hours, refrain from heavy activities involving lifting, pushing, or pulling objects weighing more than 2.2 kilograms with the arm that underwent the procedure for at least 3 days, and avoid deep flexion-extension movements involving the operated wrist, including activities such as lifting chairs and beds, for 48 hours. Showering is allowed, but activities such as dishwashing and swimming should be avoided for 3-4 days. Patients working in office and desk jobs can return to work 3 days after transradial CAG, while those involved in heavy labor are recommended to rest for 2 weeks (30). Despite the successful treatment achieved by opening the narrowed or fully occluded vessel during the CAG, the patient should adopt a lifestyle that includes proper nutrition, exercise, quitting smoking, reducing anxiety, fear, and stress factors, improving sleep quality,

medication management, and controlling high blood pressure and cholesterol levels to prevent re-narrowing of the vessel (14,39).

CONCLUSION

The procedure of accessing coronary arteries through the radial artery is increasing worldwide with each passing day. Alongside the advancements in science and technology, the nursing profession is also being influenced and evolving. One of the crucial steps to improve the quality of nursing care is to standardize care, keep up with the literature, and provide optimal care to patients based on scientific knowledge. Nurses, as essential members of the multidisciplinary healthcare system, have independent and collaborative roles with other healthcare professionals. Through these roles, nurses play a significant part in all stages of the process before, during, and after transradial CAG, contributing to the quality of patient care and the healthcare system. It is believed that preventing potential complications during transradial CAG, reducing healthcare costs, shortening hospital stays, and increasing patient satisfaction can be achieved through quality nursing care.

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